SERV 7579

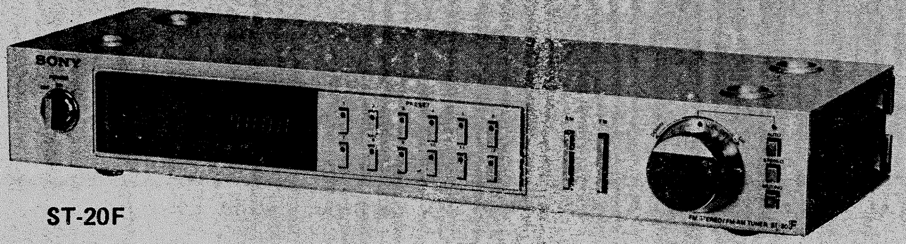
ST-20F/20FB

ST-20F: Silver Type

US Model
AEP Model
E Model

ST-20FB: Black Type

Canadian Model
AEP Model



ST-20F

STEREO TUNER

SPECIFICATIONS

GENERAL

Power Requirements:	120 V ac, 60 Hz (US, Canadian model) 220 V ac (or 240 V ac adjustable by authorized Sony personnel), 50/60 Hz (AEP model) 120, 220, or 240 V ac adjustable, 50/60 Hz (E model)
Power Consumption:	12 W
Dimensions:	Approx. 430 (w) x 70 (h) x 180 (d) mm 17 (w) x $2\frac{3}{4}$(h) x $7\frac{1}{8}$(d) inches (E model) Approx. 430 (w) x 70 (h) x 170 (d) mm 17 (w) x $2\frac{3}{4}$(h) x $6\frac{5}{8}$(d) inches (US, Canadian, AEP model) including projecting parts and controls.
Weight:	Approx. 3.0 kg, 6 lb 10 oz (net) (E model) Approx. 2.9 kg, 6 lb 6 oz (net) (US, Canadian, AEP model)

FM SECTION

Frequency Range:	87.5 – 108 MHz (US, Canadian model) 87.55 – 108 MHz (E, AEP model)
Antenna Terminals:	300 Ω, balanced 75 Ω, unbalanced
Intermediate Frequency:	10.7 MHz
Sensitivity at 50 dB Quieting (75 kHz deviation):	3.5 μV, 16.1 dBf (MONO) 45 μV, 38.3 dBf (STEREO)
Usable Sensitivity:	IHF 1.8 μV, 10.2 dBf DIN 1.3 μV (S/N = 26 dB, 40 kHz deviation)

— Continued on Page 2 —

SAFETY-RELATED COMPONENT WARNING!!

COMPONENTS IDENTIFIED BY SHADING AND MARK ⚠ ON THE SCHEMATIC DIAGRAMS, EXPLODED VIEWS AND IN THE PARTS LIST ARE CRITICAL TO SAFE OPERATION. REPLACE THESE COMPONENTS WITH SONY PARTS WHOSE PART NUMBERS APPEAR AS SHOWN IN THIS MANUAL OR IN SUPPLEMENTS PUBLISHED BY SONY.

ATTENTION AU COMPOSANT AYANT RAPPORT À LA SÉCURITÉ!

LES COMPOSANTS IDENTIFIÉS PAR UN TRAMÉ ET UNE MARQUE ⚠ SUR LES DIAGRAMMES SCHÉMATIQUES, LES VUES EXPLOSÉES ET LA LISTE DES PIÈCES SONT CRITIQUES POUR LA SÉCURITÉ DE FONCTIONNEMENT. NE REMPLACER CES COMPOSANTS QUE PAR DES PIÈCES SONY DONT LES NUMÉROS SONT DONNÉS DANS CE MANUEL OU DES SUPPLÉMENTS PUBLIÉS PAR SONY.

SONY®

SERVICE MANUAL

S/N Ratio:	75 dB (MONO) 70 dB (STEREO)
Harmonic Distortion:	0.1 % (MONO) at 1 kHz 0.25 % (STEREO) at 1 kHz
IM Distortion:	0.1 % (MONO) 0.25 % (STEREO)
Separation:	45 dB at 1 kHz
Frequency Response:	IHF 30 Hz – 15 kHz $^{+0.5}_{-2.0}$ dB DIN 40 Hz – 12.5 kHz $^{+0.5}_{-1.0}$ dB
Alternate Channel Selectivity:	IHF 60 dB (400 kHz) DIN 55 dB (300 kHz)
Capture Ratio:	1.0 dB
AM Suppression Ratio:	54 dB
Image Response Ratio:	85 dB
Muting Threshold:	Approx. 5 µV
Output Level:	450 mV, 4.7 kΩ (1 kHz, 40 kHz deviation) (AEP model) 450 mV, 4.7 kΩ (1 kHz, 75 kHz deviation) (US, Canadian, E model)

AM SECTION

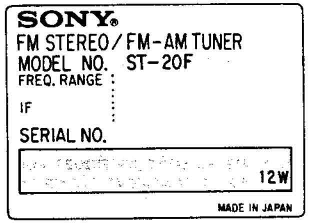
Frequency Range:	531 – 1,602 kHz (AEP model) 525 – 1,605 kHz (with channel plan selector set at 10 kHz) 531 – 1,602 kHz (with channel plan selector set at 9 kHz) (US, Canadian, E model)
Antennas:	External antenna terminal Attached antenna wire
Usable Sensitivity:	100 µV (1,000 kHz)
S/N Ratio:	52 dB (5 mV)
Harmonic Distortion:	0.3 % (5 mV, 400 Hz)
Selectivity:	50 dB (9 kHz)
Image Response Ratio:	40 dB (1,000 kHz)

SERVICE PRECAUTIONS

1. If the content of the preset memory has been changed during the service, be sure to inform it to the customer.
2. Do not disassemble the key board switch.
3. If the signal cannot be tuned by automatic tuning, check if there is enough input signal level at the place where the customer is using the set.

MODEL IDENTIFICATION

– Specification Label –



SONY®
FM STEREO/FM-AM TUNER
MODEL NO. ST-20F
FREQ. RANGE :
IF :
SERIAL NO.
12W
MADE IN JAPAN

US model:	AC 120 V 60 Hz	ST-20F
Canadian model:	AC 120 V 60 Hz	ST-20FB
AEP model:	AC 220 V ~ 50 Hz	ST-20F or ST-20FB
E model:	AC 120, 220, 240 V ~ 50/60 Hz	ST-20F

Handling Precautions for MOS ICs

Generally, the insulation resistance of the oxide layer in MOS IC structures is very high, and the oxide layer is very thin. Because of this, it is possible that the static voltages usually present on clothes and the human body will be enough to generate a potential difference across the insulator, high enough to cause a breakdown of the insulating layer.

The following precautions should be taken while handling these ICs.

(Particular care should be taken under conditions of low humidity.)

Precautions in Replacing MOS ICs

1. Store new ICs by inserting them into a urethane-polyester cushion (which is somewhat conductive), or wrapping it in aluminum foil, so that all the pins are at the same potential.
   (The ICs should be stored in that manner until mounted on the circuit board.)

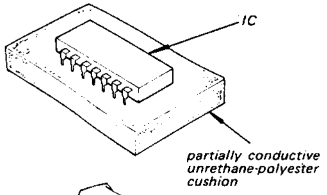


Fig. A

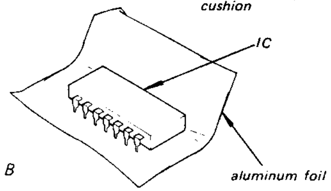


Fig. B

2. Check the soldering iron for possible power-line leakage current. Make sure that there is no leakage path by connecting an ohmmeter to the tip of the soldering iron and the plug as shown in Fig. C. If there is a leakage path, use some other soldering iron.

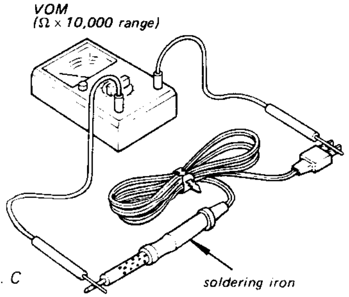


Fig. C

3. Equalize any potential difference between the clothes, the tools in use, the work bench, the set being worked on, and the packaged IC by touching them all in succession with the hands or a conductive wire or tool.
4. The following are effective methods for handling ICs that remove the potential difference across the oxide layer.
   - Use a paper clip modified by soldering in a wire braid insert.

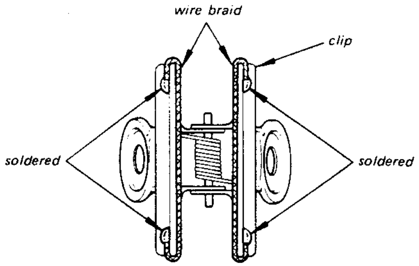


Fig. D *Make sure that there is no solder on the inside.*

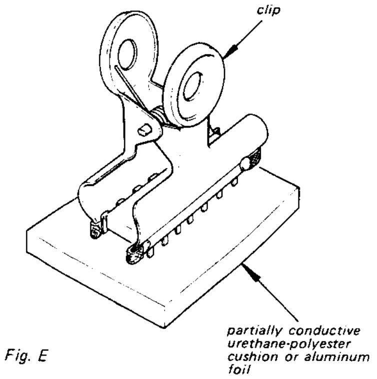

clip
partially conductive urethane-polyester cushion or aluminum foil

Fig. E

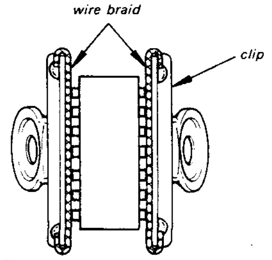


Fig. F *Make sure that all the pins are in contact with the wire braid (all the pins will then be at the same potential.).*

- **Take a short length of fine bare wire and wind it around the IC so that it shorts all the pins of the IC, while it is still in the urethane-polyester cushion or aluminum foil. This ensures that all the pins are at the same potential.**

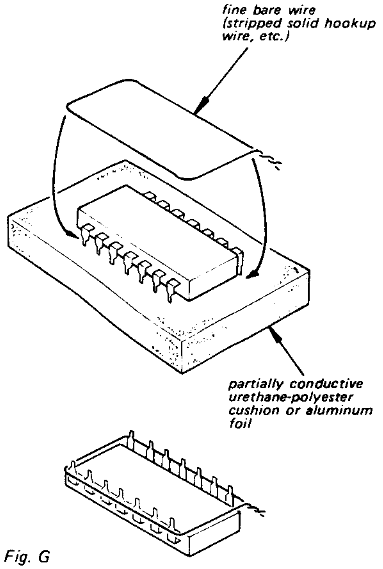

fine bare wire
(stripped solid hookup wire, etc.)
partially conductive urethane-polyester cushion or aluminum foil

Fig. G

- When it is necessary to handle the IC with the fingers, do not touch any pin, and hold the IC at the ends of its plastic-package case as shown in Fig. H.

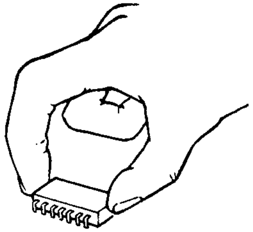


Fig. H

5. Method of Mounting
Insert the IC while holding it with the modified clip, and solder all the pins with the clip still shorting the pins. (Similarly, solder all the pins while the bare shorting wire is still wound around them.). Remove the clip or the bare shorting wire only after all the pins have been soldered.

Precaution while Checking C-MOS ICs

The C-MOS ICs (Complementary MOS) are MOS ICs that have their output sections made up of N-channel and P-channel push-pull stages to increase their speed of operation. If the output terminal of these ICs comes into contact with B+ or B- voltage, then the FET which is ON at that time will either become shorted or open.

This is valid for all the output sections that are connected together by the interconnections. Even the circuits that are physically separated (and not on the same board) can be destroyed simultaneously.

Example:

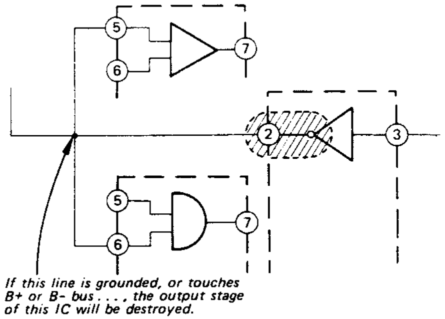
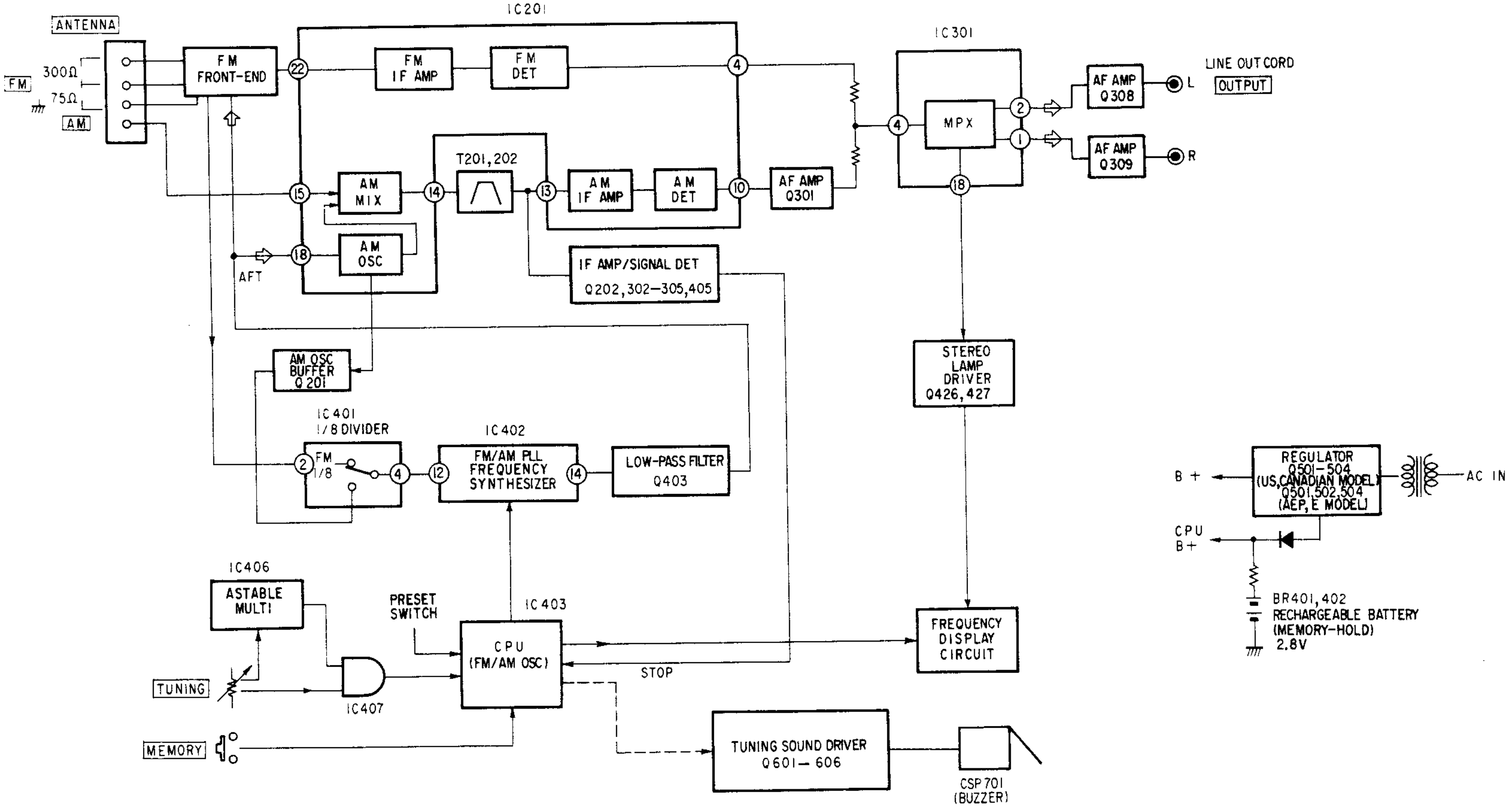

5
6
7
2
3
5
6
7
If this line is grounded, or touches B+ or B- bus . . . , the output stage of this IC will be destroyed.

Fig. I

SECTION 1
OUTLINE

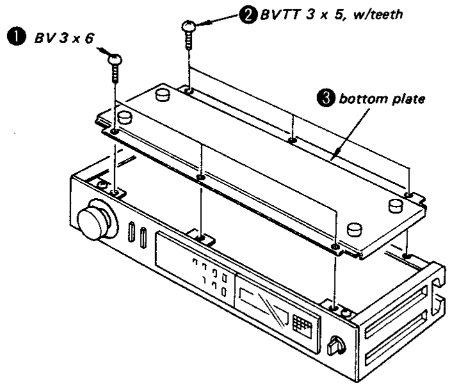
1-1. BLOCK DIAGRAM


ANTENNA
FM
300Ω
75Ω
AM
FM FRONT-END
IC201
22
FM IF AMP
FM DET
4
15
AM MIX
14
T201, 202
13
AM IF AMP
AM DET
10
AF AMP Q301
18
AM OSC
AFT
IF AMP/SIGNAL DET Q202, 302–305, 405
IC301
4
MPX
2
1
18
AF AMP Q308
AF AMP Q309
L
R
LINE OUT CORD
OUTPUT
STEREO LAMP DRIVER Q426, 427
AM OSC BUFFER Q201
IC401 1/8 DIVIDER
2
FM
1/8
4
IC402
12
FM/AM PLL FREQUENCY SYNTHESIZER
14
LOW-PASS FILTER Q403
IC406
ASTABLE MULTI
TUNING
IC407
PRESET SWITCH
IC403
CPU (FM/AM OSC)
STOP
FREQUENCY DISPLAY CIRCUIT
MEMORY
TUNING SOUND DRIVER Q601–606
CSP701 (BUZZER)
B+
REGULATOR Q501–504 (US, CANADIAN MODEL) Q501, 502, 504 (AEP, E MODEL)
AC IN
CPU B+
BR401, 402 RECHARGEABLE BATTERY (MEMORY-HOLD) 2.8V

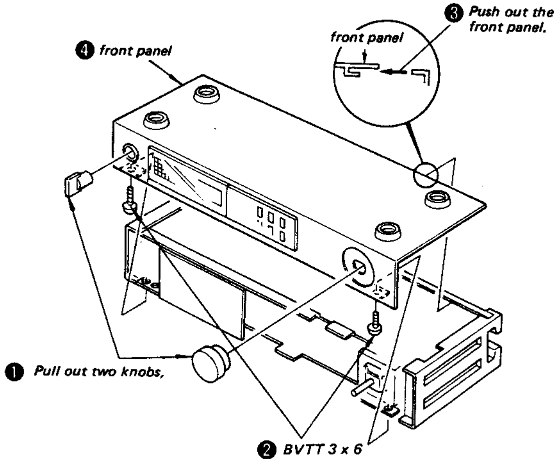
SECTION 2
DISASSEMBLY

Note: Follow the disassembly procedure in the numerical order given.

BOTTOM PLATE REMOVAL


❶ BV 3 x 6
❷ BVTT 3 x 5, w/teeth
❸ bottom plate

FRONT PANEL REMOVAL

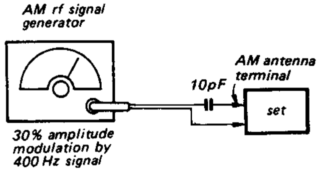

❸ Push out the front panel.
front panel
❹ front panel
❶ Pull out two knobs.
❷ BVTT 3 x 6

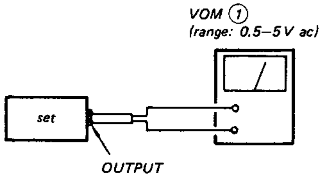
SECTION 3
ADJUSTMENTS

3-1. AM SECTION

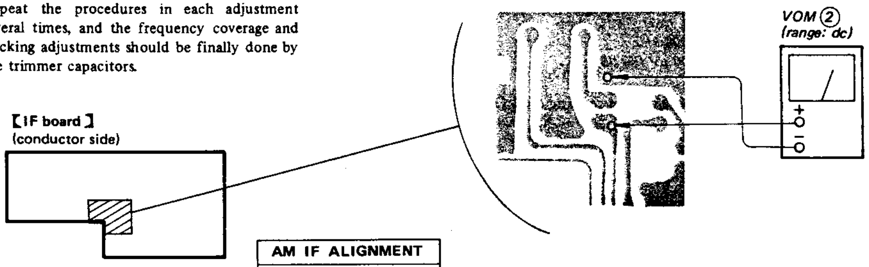
Setting:

FM/AM Switch : AM
AUTO Switch : OFF

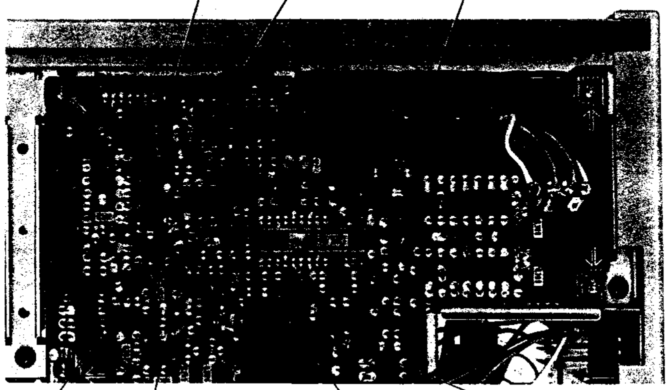

AM rf signal generator
AM antenna terminal
10pF
set
30% amplitude modulation by 400 Hz signal


VOM ①
(range: 0.5–5 V ac)
set
OUTPUT

- Repeat the procedures in each adjustment several times, and the frequency coverage and tracking adjustments should be finally done by the trimmer capacitors.


【IF board】
(conductor side)
VOM ②
(range: dc)
+
−

AM IF ALIGNMENT	
Adjust for a maximum reading on VOM ①.	
459 kHz	
T202	T201



CT102	T102
1,400 kHz	600 kHz
Adjust for a maximum reading on VOM ②.	
AM TRACKING ADJUSTMENT	

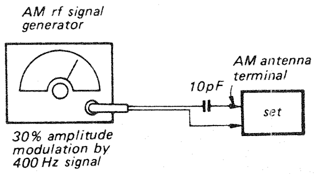
T101	CT101
600 kHz	1,400 kHz
Adjust for 2.5 V dc reading on VOM ②.	Adjust for 13 V dc reading on VOM ②.
AM FREQUENCY COVERAGE ADJUSTMENT	

AM AUTO TUNING Level Adjustment

Setting:

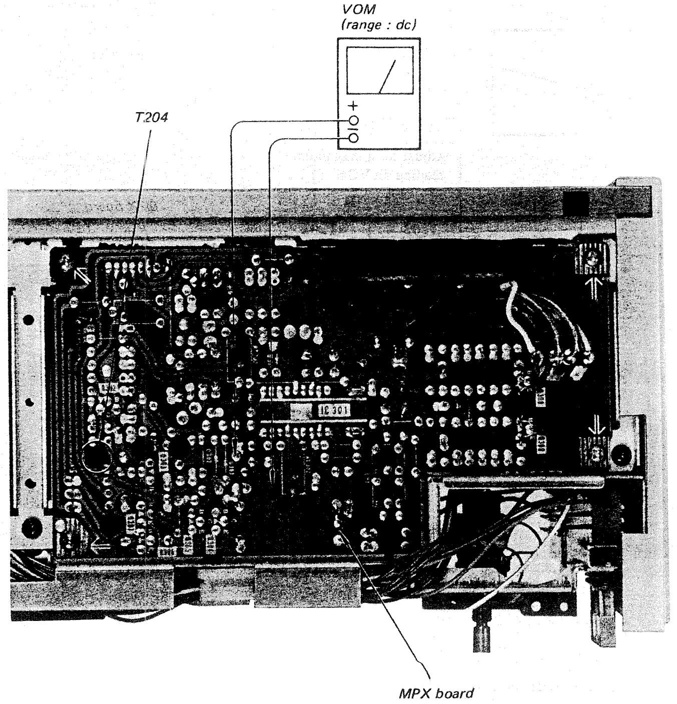
FM/AM Switch : AM
AUTO Switch : OFF

Procedure:


AM rf signal generator
AM antenna terminal
10pF
set
30% amplitude modulation by 400 Hz signal

Carrier frequency : 1000 kHz
Output level : 300 μV (50 dB)

1. Adjust T204 for maximum reading on VOM.


VOM
(range : dc)
+
T204
IC301
MPX board

3-2. FM SECTION

The FM front-end can not be repaired and it is supplied as the FM front-end block. Therefore, FM frequency adjustment, FM tracking adjustment and FM IF alignment are not necessary.

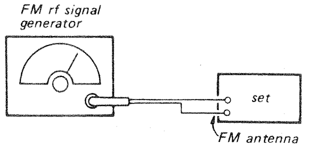
76 kHz Adjustment

Setting:

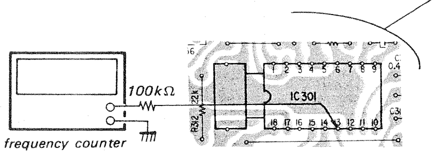
FM/AM Switch : FM
STEREO Switch: ON
AUTO Switch : OFF

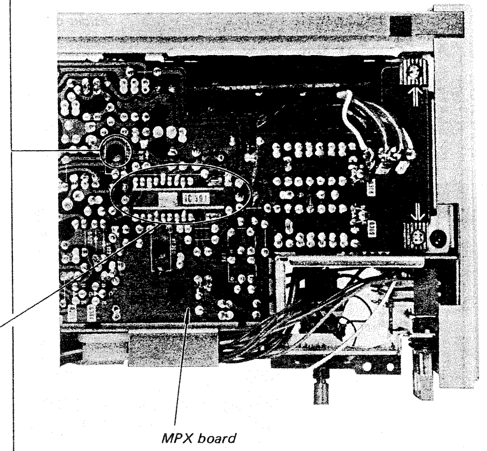
A) Regular Method

Procedure:


FM rf signal generator
set
FM antenna terminal

Carrier frequency: 98 MHz
Modulation: 400 Hz, 75 kHz deviation (100%)
Output level: 1 mV (60 dB)


100kΩ
frequency counter
IC301

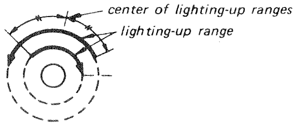

RT303
IC301
MPX board

1. Tune the set to 98 MHz.
2. Adjust RT303 for 76 kHz ±100 Hz on the counter.

B) Simple Method

Procedure:

1. Tune the set to the FM stereo broadcasting signal.
2. Turn RT303 clockwise or counterclockwise and memorize the lighting-up range of the stereo lamp.
3. Secure RT303 at the center of the lighting-up range of both turns as shown below.


center of lighting-up ranges
lighting-up range

Discriminator Alignment

Setting:

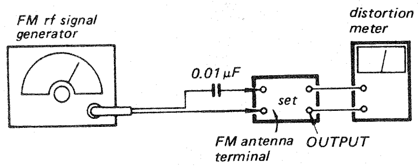
FM/AM Switch : FM

AUTO Switch : OFF

MUTING Switch : OFF

A) Secondary Side

Procedure:

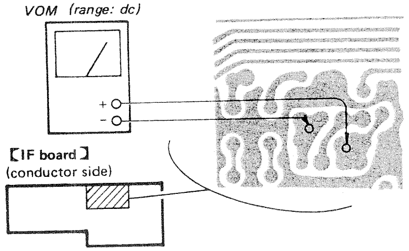

FM rf signal generator
distortion meter
0.01 μF
set
FM antenna terminal
OUTPUT

Carrier frequency:	*98 MHz*
Modulation:	*400 Hz, 75 kHz deviation (100%)*
Output level:	*1 mV (60 dB)*

1. Tune the set to 98 MHz.
2. Turn the core (secondary side: black) of T203 for minimum distortion reading on the distortion meter.

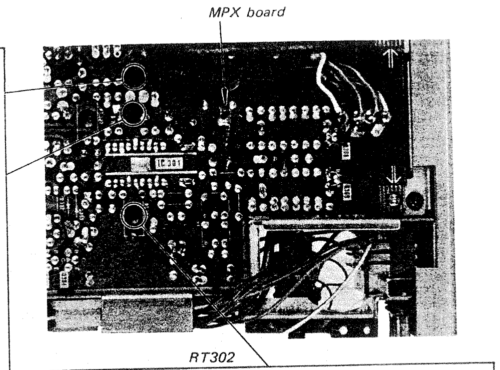
B) Primary Side

1. Connect the VOM as shown below.


VOM (range: dc)
+
-
[IF board]
(conductor side)

2. Tune the set to 98 MHz.
3. Turn the core (primary side: orange) of T203 for 0V dc reading on VOM.

Note: When the ceramic filter is replaced, these adjustments should be made. Repeat the secondary side and primary side adjustments several times.


MPX board
T203 secondary side: black
T203 primary side: orange
RT302

FM Stereo Separation Adjustment

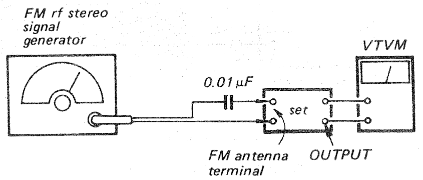
Setting:

FM/AM switch : FM

STEREO switch : ON

AUTO switch : OFF

Procedure:


FM rf stereo signal generator
VTVM
0.01 μF
set
FM antenna terminal
OUTPUT

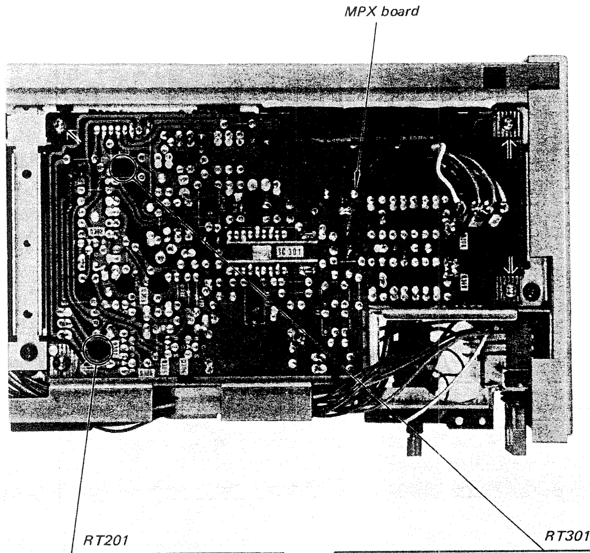
Carrier frequency:	*98 MHz*
Output level:	*1 mV (60 dB)*
Mode:	*Stereo*
Modulation:	
Audio (400 Hz):	*67.5 kHz deviation (90%)*
Pilot (19 kHz):	*7.5 kHz deviation (10%)*

FM stereo signal generator output channel	VTVM connection	VTVM reading (dB)
L-CH	L-CH	Ⓐ
R-CH	L-CH	Ⓑ Adjust RT302 for minimum reading.
R-CH	R-CH	Ⓒ
L-CH	R-CH	Ⓓ Adjust RT302 for minimum reading.

L-CH Stereo separation: Ⓐ – Ⓑ

R-CH Stereo separation: Ⓒ – Ⓓ

The separations of both channels should be equal.


MPX board
RT201
RT301

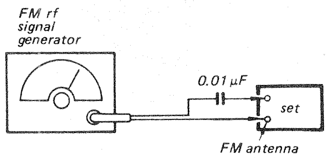
SIGNAL STRENGTH Indicator Adjustment

Setting:

FM/AM switch : FM

AUTO switch : OFF

Procedure:


FM rf signal generator
0.01 μF
set
FM antenna terminal

Carrier frequency:	*98 MHz*
Modulation:	*400 Hz, 75 kHz deviation (100%)*
Output level:	*1 mV (60 dB)*

Adjust RT201 so that the SIGNAL STRENGTH indicator completely lights up.

Muting Level Adjustment

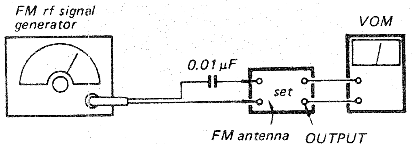
Setting:

FM/AM switch : FM

MUTING switch : ON

AUTO switch : OFF

Procedure:


FM rf signal generator
VOM
0.01 μF
set
FM antenna terminal
OUTPUT

Carrier frequency:	*98 MHz*
Modulation:	*400 Hz, 75 kHz deviation (100%)*
Output level:	*5.6 μV (15 dB)*

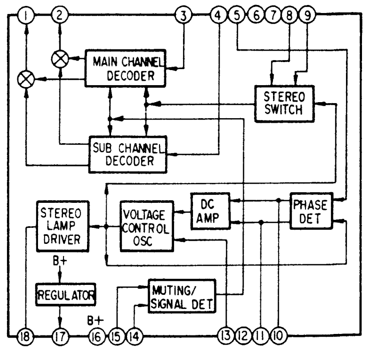
Turn RT301 and stop it just when the VOM indication suddenly decreases.

SECTION 4
DIAGRAMS

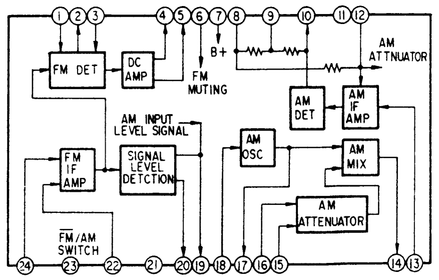
US,Canadian model

- **Block Diagram of ICs**

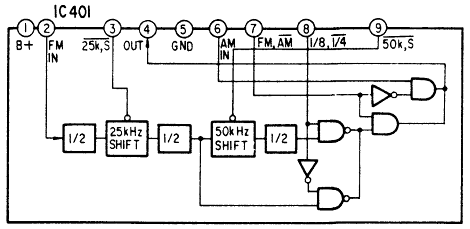
IC301


MAIN CHANNEL DECODER
STEREO SWITCH
SUB CHANNEL DECODER
STEREO LAMP DRIVER
VOLTAGE CONTROL OSC
DC AMP
PHASE DET
REGULATOR
MUTING/ SIGNAL DET
B+

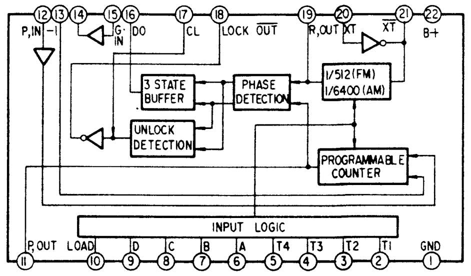
IC201


FM DET
DC AMP
FM MUTING
AM ATTNUATOR
AM DET
AM IF AMP
AM INPUT LEVEL SIGNAL
FM IF AMP
SIGNAL LEVEL DETECTION
AM OSC
AM MIX
AM ATTENUATOR
FM/AM SWITCH
B+

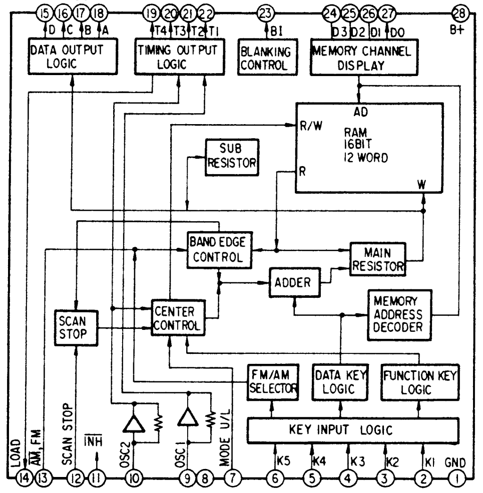
IC401


B+
FM IN
25k,S
OUT
GND
AM IN
FM,AM
1/8,1/4
50k,S
1/2
25kHz SHIFT
1/2
50kHz SHIFT
1/2

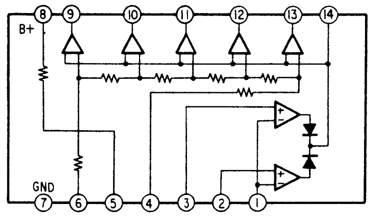
IC402


P,IN
G. IN
DO
CL
LOCK OUT
R,OUT
XT
XT
B+
3 STATE BUFFER
PHASE DETECTION
1/512(FM) 1/6400(AM)
UNLOCK DETECTION
PROGRAMMABLE COUNTER
INPUT LOGIC
P,OUT
LOAD
D
C
B
A
T4
T3
T2
T1
GND

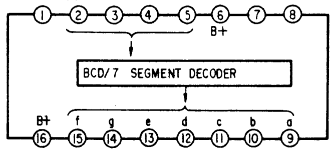
IC403


D
C
B
A
T4
T3
T2
T1
B1
D3
D2
D1
D0
B+
DATA OUTPUT LOGIC
TIMING OUTPUT LOGIC
BLANKING CONTROL
MEMORY CHANNEL DISPLAY
AD
R/W
RAM 16BIT 12 WORD
SUB RESISTOR
R
W
BAND EDGE CONTROL
MAIN RESISTOR
ADDER
SCAN STOP
CENTER CONTROL
MEMORY ADDRESS DECODER
FM/AM SELECTOR
DATA KEY LOGIC
FUNCTION KEY LOGIC
KEY INPUT LOGIC
LOAD
AM,FM
SCAN STOP
INH
OSC2
OSC1
MODE U/L
K5
K4
K3
K2
K1
GND

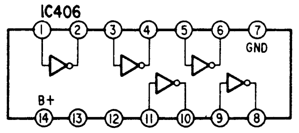
IC404



IC405


B+
BCD/7 SEGMENT DECODER
B+
f
g
e
d
c
b
a

IC406

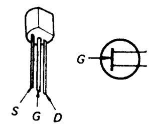


US,Canadian model

Replacement Semiconductors

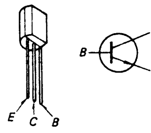
For replacement, use semiconductors except in (   ).

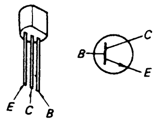
Q201: 2SK23A-840 (2SK30A)



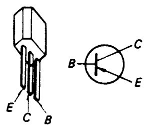
Q202, 302–307
Q401, 405, 406
Q408–412,
Q501, 503
Q427, 428
Q601–606
} **: 2SC1364 (2SC536NP)**

Q301, 308
Q403, 309 **: 2SC1362 (2SC900)**

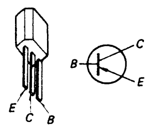


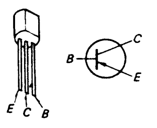


Q402,
Q413–425 : 2SA1027R (2SA1015)

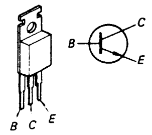


Q404: 2SA1027R (2SA733)
Q426: 2SA1027R (2SA893A)

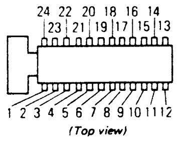




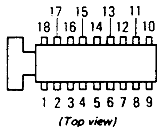
Q502, 504: 2SC1061 (2SC1419)



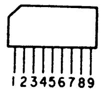
IC201: CX168


24 22 20 18 16 14
23 21 19 17 15 13
1 2 3 4 5 6 7 8 9 10 11 12
(Top view)

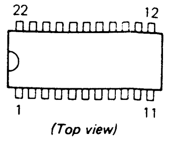
IC301: CX178


17 15 13 11
18 16 14 12 10
1 2 3 4 5 6 7 8 9
(Top view)

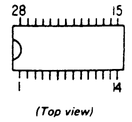
IC401: CX554



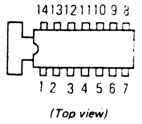
IC402: CX552A (CX552)


22
12
1
11
(Top view)

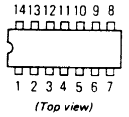
IC403: CX553A(CX553)


28
15
1
14
(Top view)

IC404: LB1416

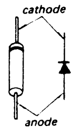

14 13 12 11 10 9 8
1 2 3 4 5 6 7
(Top view)

IC405: TC4055BP
IC406: MSM4069 (TC4069P)
IC407: TC4011BP (TC4011P)

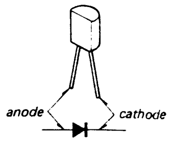

14 13 12 11 10 9 8
1 2 3 4 5 6 7
(Top view)

D101, 203
D301–303
D402–404
D407, 408
D423, 424
D410
D415–420
D426
D601, 602
} **: 1S1555**

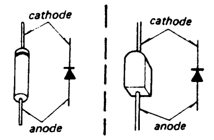
D409: 1T22AM (1T22A)


cathode
anode

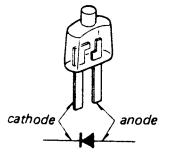
D201, 202: SMV1380


anode
cathode

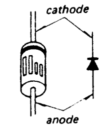
D401
D501–507 } **: 10E2** **(RA1Z)**


cathode
anode
cathode
anode

D405: TLY226 (AY2434D)
D406: TLR226 (PR2434D)


cathode
anode

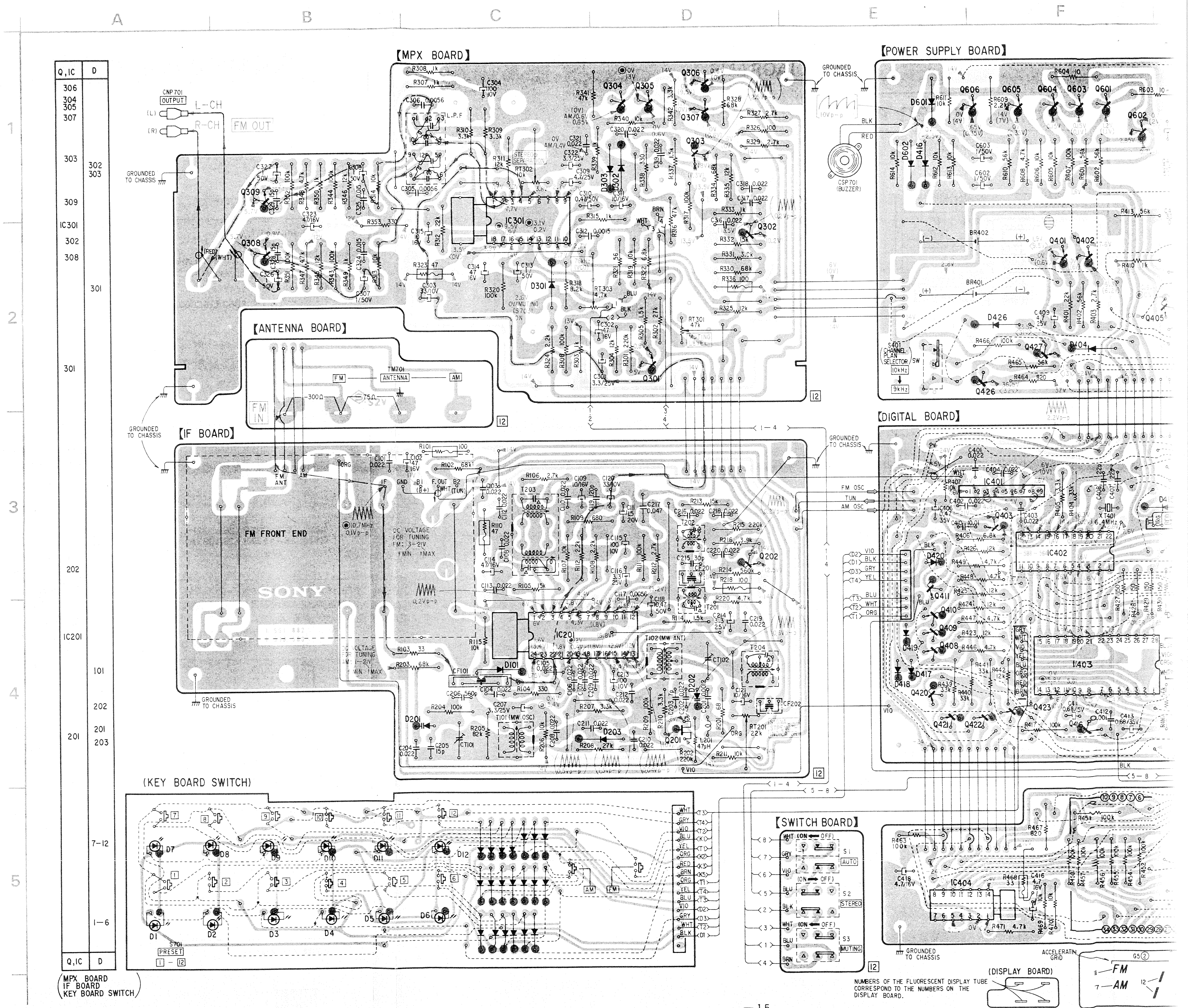
D508: EQB01-30 (EQA01-30R)
D509: EQB01-09 (EQA01-09S)
D510: EQB01-07 (EQA01-07R)


cathode
anode

US,Canadian model

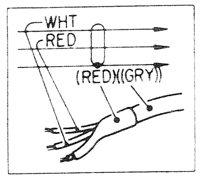
4-1. MOUNTING DIAGRAM
– Conductor Side –

- Replacement Semiconductor: See page 13.
- Block Diagram of ICs: See page 12.


A
B
C
D
E
F
1
2
3
4
5
Q,IC
D
306
304
305
307
303
302
303
309
IC301
302
308
301
301
202
IC201
101
202
201
203
201
7–12
1–6
MPX BOARD
IF BOARD
KEY BOARD SWITCH
[MPX BOARD]
[POWER SUPPLY BOARD]
[ANTENNA BOARD]
[IF BOARD]
[DIGITAL BOARD]
(KEY BOARD SWITCH)
[SWITCH BOARD]
(DISPLAY BOARD)
CNP701 OUTPUT
L-CH
R-CH
FM OUT
GROUNDED TO CHASSIS
IC301
IC201
IC401
IC402
IC403
IC404
FM FRONT END
SONY
TM701
FM
ANTENNA
AM
FM IN
CSP701 (BUZZER)
S401 CHANNEL PLAN SELECTOR SW
S701 PRESET
S1 AUTO
S2 STEREO
S3 MUTING
ACCELERATING GRID
FM
AM
NUMBERS OF THE FLUORESCENT DISPLAY TUBE CORRESPOND TO THE NUMBERS ON THE DISPLAY BOARD.

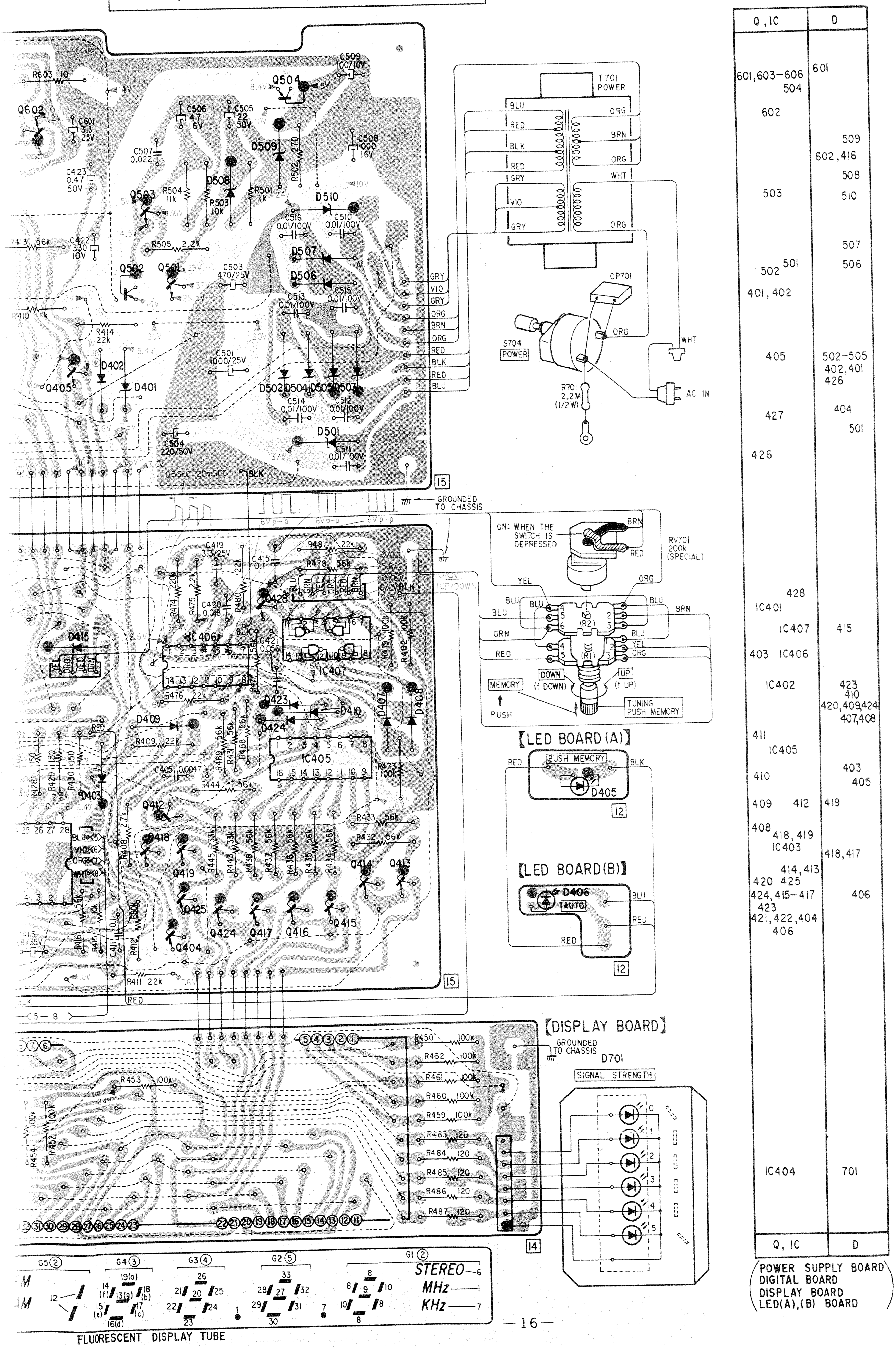
Note:

- Color code of sleeving over the end of the jacket.


WHT
RED
(RED)((GRY))

- [ ]⊢ : indicates side identified with part number.
- ⊗ : Through hole.
- ⊗--⊗ : component-side pattern
- : B+ pattern
- ▨ : B– pattern
- Signal Path
  - —·→ : L-CH
  - —··→ : R-CH
- Voltages are dc with respect to ground unless otherwise noted.
- Readings are taken under no signal conditions with a VOM (20 kΩ/V).
  - no mark: FM no signal conditions of 88 MHz. (STEREO switch: ON / MUTING switch: OFF)
  - ( ): AM no signal conditions of 520 kHz.
  - [ ]: While receiving signal is changed.
  - ◉ : When either FM signal or AM signal is tuned.
  - FM: When the FM signal is tuned.
  - AM: When the AM signal is tuned.
  - < >: When the FM stereo signal is tuned.
- Waveforms are measured with respect to ground.

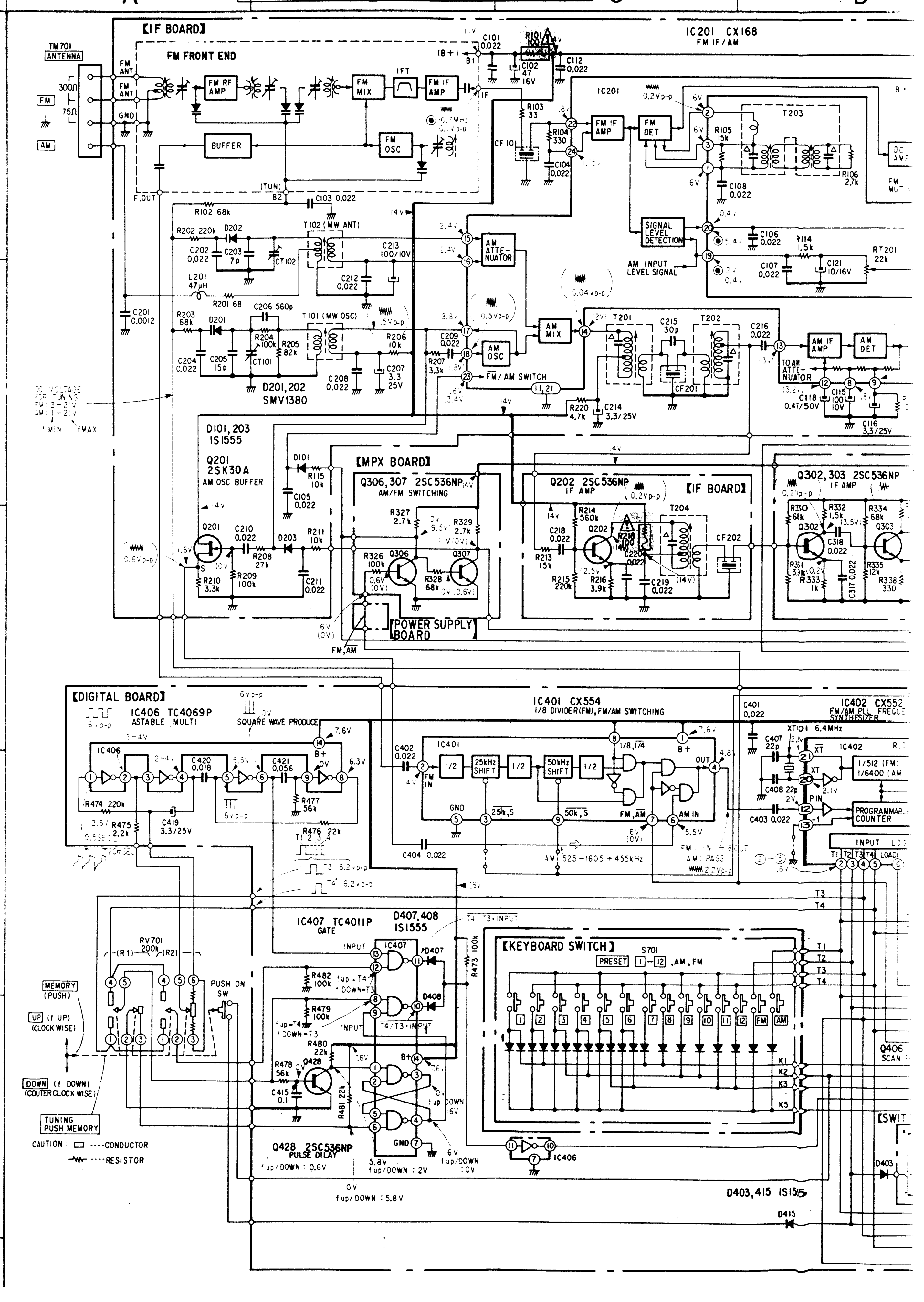
US,Canadian model

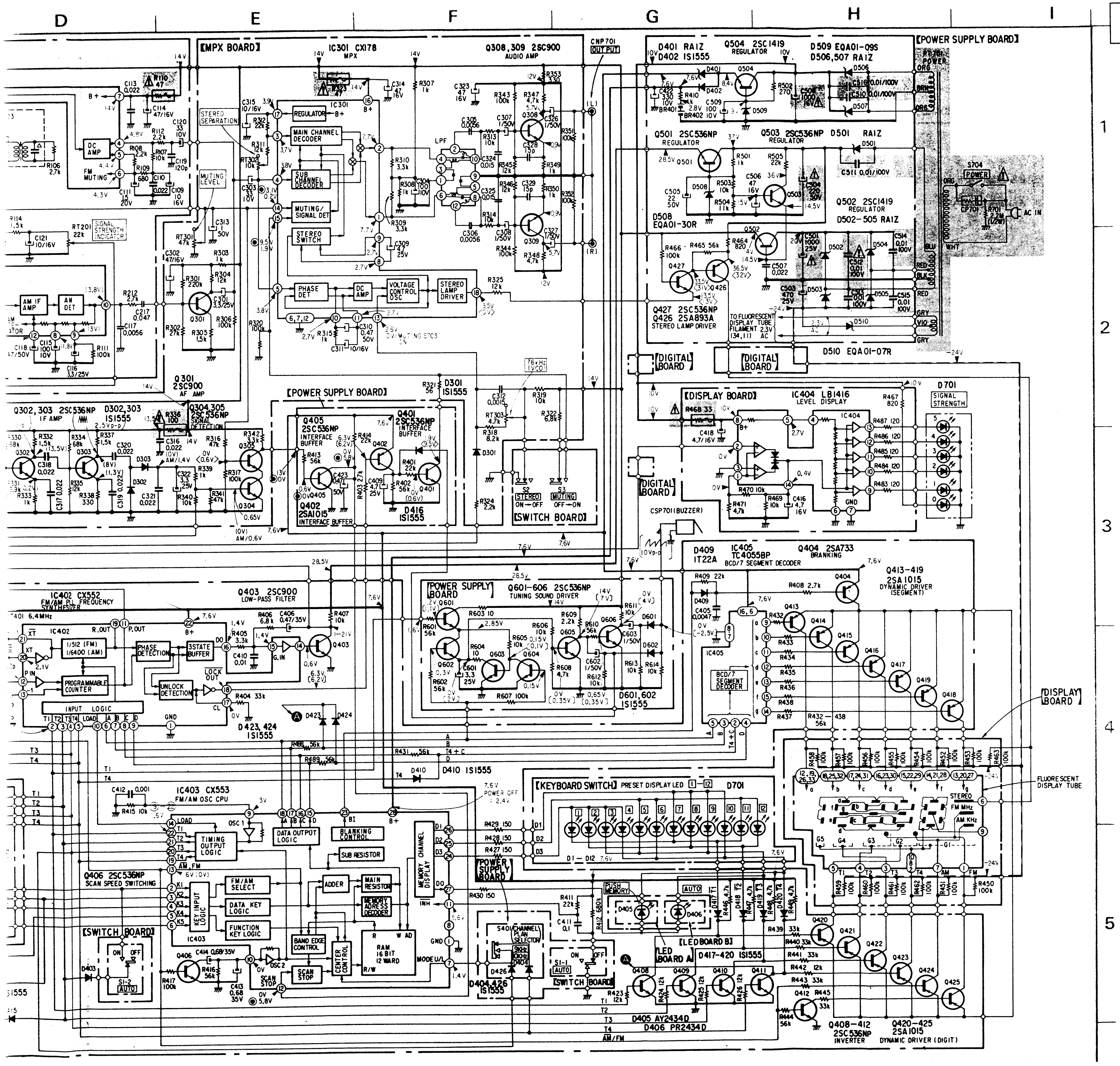


Q,IC
D
601,603–606
504
601
602
509
602,416
508
503
510
507
502
501
506
401,402
405
502–505
402,401
426
427
404
501
426
428
IC401
IC407
415
403 IC406
IC402
423
410
420,409,424
407,408
411
IC405
403
410
405
409 412
419
408
418,419
IC403
418,417
414,413
420 425
424,415–417
406
423
421,422,404
406
IC404
701
POWER SUPPLY BOARD
DIGITAL BOARD
DISPLAY BOARD
LED(A),(B) BOARD
T701 POWER
BLU
RED
BLK
RED
GRY
VIO
GRY
ORG
BRN
ORG
WHT
ORG
CP701
S704 POWER
R701 2.2M (1/2W)
AC IN
GROUNDED TO CHASSIS
ON: WHEN THE SWITCH IS DEPRESSED
RV701 200k (SPECIAL)
MEMORY
PUSH
DOWN (f DOWN)
UP (f UP)
TUNING PUSH MEMORY
【LED BOARD(A)】
PUSH MEMORY
D405
【LED BOARD(B)】
D406
AUTO
【DISPLAY BOARD】
D701
SIGNAL STRENGTH
FLUORESCENT DISPLAY TUBE
STEREO
MHz
KHz
G5② G4③ G3④ G2⑤ G1②
Q504 Q602 Q503 Q502 Q501 Q405 Q428 Q412 Q418 Q419 Q425 Q424 Q417 Q416 Q415 Q414 Q413 Q404
D509 D508 D510 D507 D506 D502 D504 D505 D503 D501 D402 D401 D415 D409 D403 D423 D424 D410 D407 D408
IC406 IC407 IC405
0.5SEC~20mSEC
6Vp-p
15
12
14

4-2. SCHEMATIC DIAGRAM

US,Canadian model


A
B
C
D
1
2
3
4
5
【IF BOARD】
FM FRONT END
TM701 ANTENNA
FM ANT
GND
300Ω
75Ω
FM
AM
FM RF AMP
FM MIX
IFT
FM IF AMP
BUFFER
FM OSC
(B+) B1
IF
(TUN) B2
F.OUT
C101 0.022
R101 100
C102 47 16V
C112 0.022
R103 33
R104 330
CF101
C104 0.022
IC201 CX168 FM IF/AM
IC201
FM IF AMP
FM DET
T203
R105 15k
R106 2.7k
C108 0.022
SIGNAL LEVEL DETECTION
C106 0.022
R114 1.5k
RT201 22k
C107 0.022
C121 10/16V
AM INPUT LEVEL SIGNAL
R102 68k
C103 0.022
R202 220k
D202
T102 (MW ANT)
C202 0.022
C203 7p
CT102
C213 100/10V
C212 0.022
L201 47μH
R201 68
C201 0.0012
R203 68k
D201
C206 560p
T101 (MW OSC)
R204 100k
R205 82k
CT101
C204 0.022
C205 15p
R206 10k
C207 3.3 25V
C208 0.022
D201,202 SMV1380
AM ATTE-NUATOR
AM MIX
AM OSC
C209 0.022
R207 3.3k
FM/AM SWITCH
T201
T202
C215 30p
CF201
C216 0.022
AM IF AMP
AM DET
TO AM ATTE-NUATOR
C118 0.47/50V
C115 100 10V
C116 3.3/25V
R220 4.7k
C214 3.3/25V
DC VOLTAGE FOR TUNING FM: 3-21V AM: 1-21V
fMIN fMAX
D101,203 1S1555
Q201 2SK30A AM OSC BUFFER
D101
R115 10k
C105 0.022
C210 0.022
R208 27k
D203
R211 10k
R209 100k
R210 3.3k
C211 0.022
【MPX BOARD】
Q306,307 2SC536NP AM/FM SWITCHING
R327 2.7k
R329 2.7k
R326 100k
R328 68k
Q306
Q307
【POWER SUPPLY BOARD】
FM/AM
Q202 2SC536NP IF AMP
【IF BOARD】
R214 560k
C218 0.022
R213 15k
R215 220k
R216 3.9k
R218 100
C220 0.022
C219 0.022
T204
CF202
Q302,303 2SC536NP IF AMP
R330 68k
R332 1.5k
R334 68k
C318 0.022
R331 33k
R333 1k
C317 0.022
R335 12k
R338 330
【DIGITAL BOARD】
IC406 TC4069P ASTABLE MULTI
SQUARE WAVE PRODUCE
C420 0.018
C421 0.056
R474 220k
R475 2.2k
C419 3.3/25V
R477 56k
R476 22k
IC401 CX554 1/8 DIVIDER(FM), FM/AM SWITCHING
IC401
FM IN
1/2
25kHz SHIFT
50kHz SHIFT
1/8,1/4
B+
OUT
GND
25k,S
50k,S
FM,AM
AM IN
C402 0.022
C404 0.022
AM: 525-1605 + 455kHz
C401 0.022
IC402 CX552 FM/AM PLL FREQUENCY SYNTHESIZER
XT401 6.4MHz
C407 22p
C408 22p
C403 0.022
IC402
1/512 (FM) 1/6400 (AM)
PROGRAMMABLE COUNTER
INPUT
T1 T2 T3 T4 LOAD
T3
T4
IC407 TC4011P GATE
D407,408 1S1555
D407
D408
R482 100k
R479 100k
R473 100k
R480 22k
R478 56k
Q428
C415 0.1
R481 22k
Q428 2SC536NP PULSE DILAY
GND
RV701 200k
(R1)
(R2)
MEMORY (PUSH)
UP (f UP) (CLOCK WISE)
DOWN (f DOWN) (COUTER CLOCK WISE)
TUNING PUSH MEMORY
PUSH ON SW
【KEYBOARD SWITCH】
S701
PRESET 1-12, AM, FM
1 2 3 4 5 6 7 8 9 10 11 12 FM AM
T1 T2 T3 T4
K1 K2 K3 K5
IC406
Q406 SCAN
D403,415 1S155
D403
D415
【SWIT
CAUTION: ☐ ----CONDUCTOR
-W- ----RESISTOR


D
E
F
G
H
I
1
2
3
4
5
[MPX BOARD]
IC301 CX178 MPX
Q308,309 2SC900 AUDIO AMP
CNP701 OUT PUT
D401 RAIZ
D402 IS1555
Q504 2SC1419 REGULATOR
D509 EQA01-09S
D506,507 RAIZ
[POWER SUPPLY BOARD]
Q501 2SC536NP REGULATOR
Q503 2SC536NP REGULATOR
D501 RAIZ
Q502 2SC1419 REGULATOR
D502-505 RAIZ
D508 EQA01-30R
Q427 2SC536NP
Q426 2SA893A
STEREO LAMP DRIVER
TO FLUORESCENT DISPLAY TUBE FILAMENT
D510 EQA01-07R
S704 POWER
AC IN
REGULATOR
MAIN CHANNEL DECODER
SUB CHANNEL DECODER
MUTING/SIGNAL DET
STEREO SWITCH
PHASE DET
DC AMP
VOLTAGE CONTROL OSC
STEREO LAMP DRIVER
STEREO SEPARATION
MUTING LEVEL
SIGNAL STRENGTH INDICATOR
LPF
AM IF AMP
AM DET
DC AMP
FM MUTING
Q301 2SC900 AF AMP
Q302,303 2SC536NP IF AMP
D302,303 IS1555
Q304,305 2SC536NP SIGNAL DETECTION
[POWER SUPPLY BOARD]
Q405 2SC536NP INTERFACE BUFFER
Q401 2SC536NP INTERFACE BUFFER
Q402 2SA1015 INTERFACE BUFFER
D416 IS1555
D301 IS1555
S2 STEREO ON—OFF
S3 MUTING OFF—ON
[SWITCH BOARD]
[DIGITAL BOARD]
[DISPLAY BOARD]
IC404 LB1416 LEVEL DISPLAY
D701 SIGNAL STRENGTH
CSP701 (BUZZER)
D409 IT22A
IC405 TC4055BP BCD/7 SEGMENT DECODER
Q404 2SA733 BRANKING
Q413-419 2SA1015 DYNAMIC DRIVER (SEGMENT)
BCD/7 SEGMENT DECODER
IC402 CX552 FM/AM PLL FREQUENCY SYNTHESIZER
Q403 2SC900 LOW-PASS FILTER
PHASE DETECTION
3STATE BUFFER
PROGRAMMABLE COUNTER
UNLOCK DETECTION
INPUT LOGIC
D423,424 IS1555
[POWER SUPPLY BOARD]
Q601-606 2SC536NP TUNING SOUND DRIVER
D601,602 IS1555
D410 IS1555
IC403 CX553 FM/AM OSC CPU
TIMING OUTPUT LOGIC
DATA OUTPUT LOGIC
BLANKING CONTROL
SUB RESISTOR
KEY INPUT LOGIC
FM/AM SELECT
DATA KEY LOGIC
FUNCTION KEY LOGIC
ADDER
MAIN RESISTOR
MEMORY ADRESS DECODER
MEMORY CHANNEL DISPLAY
BAND EDGE CONTROL
CENTER CONTROL
SCAN STOP
RAM 16 BIT 12 WARD
Q406 2SC536NP SCAN SPEED SWITCHING
[SWITCH BOARD]
S1-2 AUTO
D404,426 IS1555
S401 CHANNEL PLAN SELECTOR
S1-1 AUTO
[SWITCH BOARD]
[KEYBOARD SWITCH] PRESET DISPLAY LED
D701
PUSH MEMORY
AUTO
[LED BOARD B]
LED BOARD A
D417-420 IS1555
D405 AY2434D
D406 PR2434D
Q408-412 2SC536NP INVERTER
Q420-425 2SA1015 DYNAMIC DRIVER (DIGIT)
FLUORESCENT DISPLAY TUBE
STEREO
FM MHz
AM KHz
[DISPLAY BOARD]

US,Canadian model

Note: The components identified by shading and mark ⚠ are critical for safety. Replace only with part number specified.

Note: Les composants identifiés par un tramé et une marque ⚠ sont critiques pour la sécurité. Ne les remplacer que par une pièce portant le numéro spécifié.

Note:

- All capacitors are in μF unless otherwise noted. pF : $\mu\mu$F 50 WV or less are not indicated except for electrolytics.
- All resistors are in ohms, ¼ W unless otherwise noted. kΩ : 1000Ω, MΩ : 1000 kΩ
- ⊡ : fusible resistor.
- △ : internal component.
- ―― : B+ bus.
- ▭ : panel designation.
- ▭ : adjustment for repair.
- - - - : B– bus.
- Voltages are dc with respect to ground unless otherwise noted.
- Readings are taken under no signal conditions with a VOM (20 kΩ/V).

  no mark: FM no signal conditions of 98 MHz.

  (STEREO switch: ON
  MUTING switch: OFF)

  ( ): AM no signal conditions of 520 kHz.

  [ ]: While receiving signal is changed.

  ⊙ : When either FM signal or AM signal is tuned.

  FM: When the FM signal is tuned.

  AM: When the AM signal is tuned.

  < >: When the FM stereo signal is tuned.
- Waveforms are measured with respect to ground.
- Voltage variations may be noted due to normal production tolerances.
- Switch

Ref. No.	Switch	Position
S1	AUTO	OFF
S2	STEREO	ON
S3	MUTING	OFF
S401	channel plan selector	9 kHz
S704	POWER	OFF

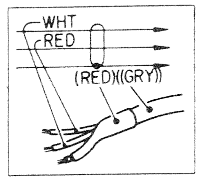
AEP,E model

4-3. MOUNTING DIAGRAM
— Conductor Side —

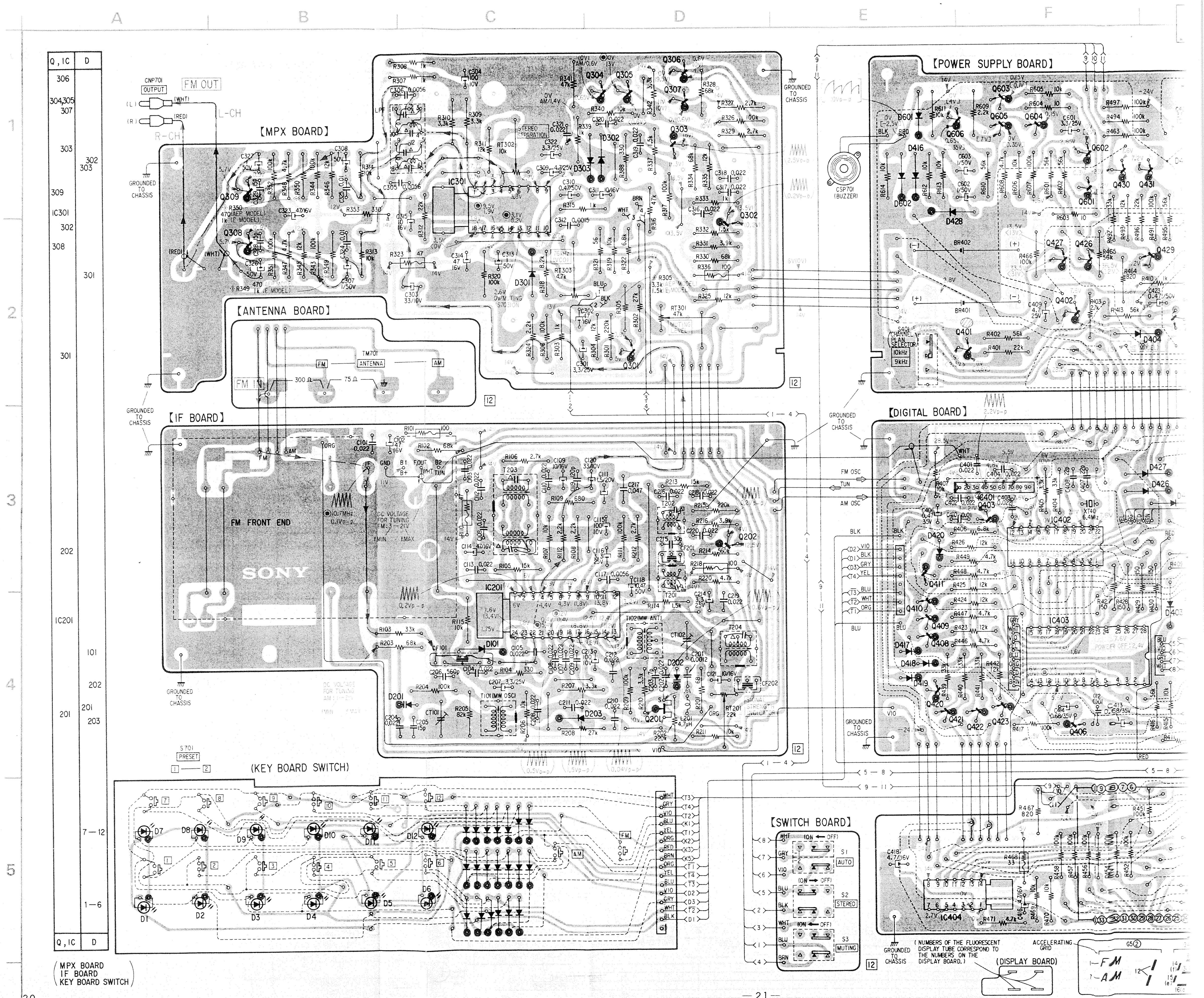
- Replacement Semiconductor: See page 26.
- Block Diagram of ICs: See page 27.

Note:

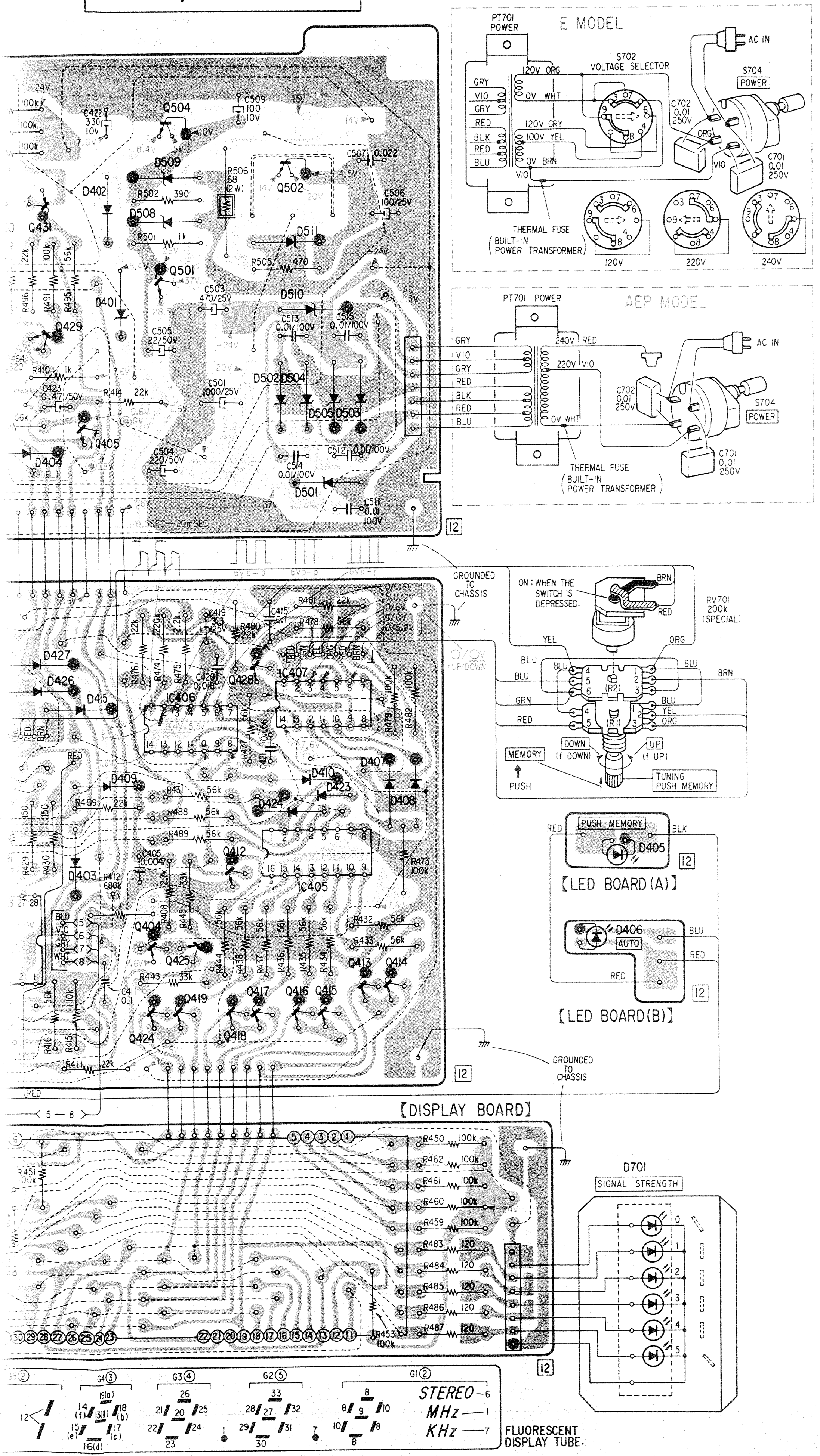
- Color code of sleeving over the end of the jacket.


WHT
RED
(RED)((GRY))

- []⊢ : indicates side identified with part number.
- ⊗ : Through hole.
- ⊗--⊗ : component-side pattern
- : B+ pattern
- ▨ : B– pattern
- Signal Path
  —·→ : L-CH
  —··→ : R-CH
- Voltages are dc with respect to ground unless otherwise noted.
- Readings are taken under no signal conditions with a VOM (20 kΩ/V).
  no mark: FM no signal conditions of 88 MHz.
  (STEREO switch: ON
  MUTING switch: OFF)
  ( ): AM no signal conditions of 520 kHz.
  [ ]: While receiving signal is changed.
  ◉ : When either FM signal or AM signal is tuned.
  FM: When the FM signal is tuned.
  AM: When the AM signal is tuned.
  < >: When the FM stereo signal is tuned.
- Waveforms are measured with respect to ground.


A
B
C
D
E
F
1
2
3
4
5
Q, IC
D
(MPX BOARD
IF BOARD
KEY BOARD SWITCH)
【MPX BOARD】
【ANTENNA BOARD】
【IF BOARD】
(KEY BOARD SWITCH)
【POWER SUPPLY BOARD】
【DIGITAL BOARD】
【SWITCH BOARD】
(DISPLAY BOARD)
FM FRONT END
SONY
FM OUT
FM IN
L-CH
R-CH
GROUNDED TO CHASSIS
CSP701 (BUZZER)
S701 PRESET
S1 AUTO
S2 STEREO
S3 MUTING
IC301
IC201
IC401
IC402
IC403
IC404
(NUMBERS OF THE FLUORESCENT DISPLAY TUBE CORRESPOND TO THE NUMBERS ON THE DISPLAY BOARD.)
ACCELERATING GRID
FM
AM

AEP,E model



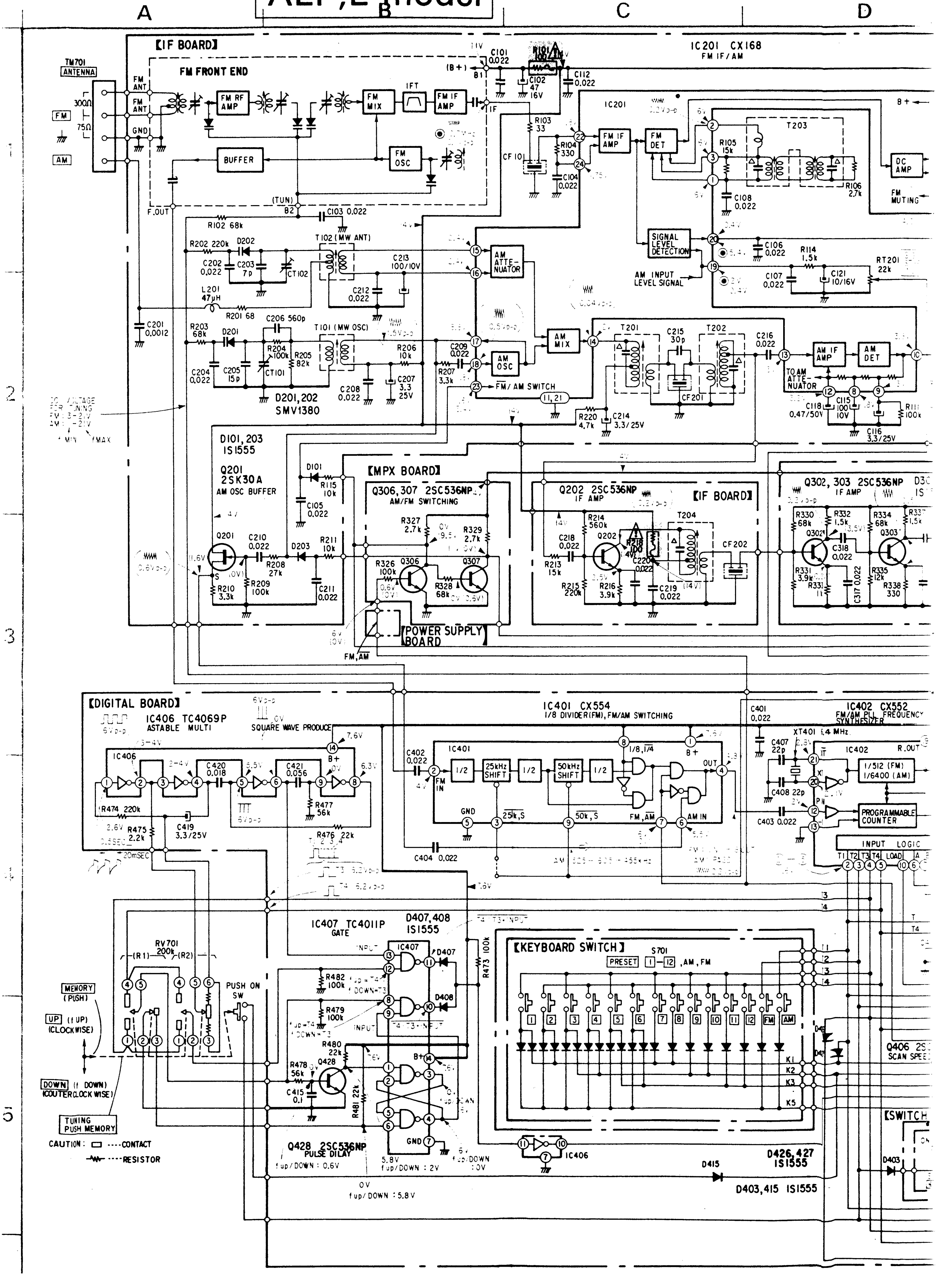
H
I
J
E MODEL
PT701 POWER
S702 VOLTAGE SELECTOR
S704 POWER
AC IN
C702 0.01 250V
C701 0.01 250V
THERMAL FUSE (BUILT-IN POWER TRANSFORMER)
120V
220V
240V
AEP MODEL
Q504
Q502
Q501
Q431
Q429
Q405
D509
D508
D511
D510
D502
D504
D505
D503
D501
D402
D401
D404
GROUNDED TO CHASSIS
ON: WHEN THE SWITCH IS DEPRESSED.
RV701 200k (SPECIAL)
MEMORY
PUSH
DOWN (f DOWN)
UP (f UP)
TUNING PUSH MEMORY
IC407
IC406
IC405
D427
D426
D415
D409
D410
D423
D424
D407
D408
D403
Q428
Q412
Q404
Q425
Q419
Q424
Q418
Q417
Q416
Q415
Q413
Q414
PUSH MEMORY
D405
[LED BOARD (A)]
D406
AUTO
[LED BOARD (B)]
[DISPLAY BOARD]
D701
SIGNAL STRENGTH
STEREO
MHz
KHz
FLUORESCENT DISPLAY TUBE

Q , IC	D
603	
606, 605,604, 504	601
502	
602	509
430,431	602 402 614 508
601	511
	428
501	
	401 510
427,426 429	
	502 — 505
402 405	
	404
401	501
428	427
IC401	426
IC407	415
403, IC406	
IC402	420 409,410 423,407 424, 408
411	
410 IC405	
409 412	403 405
408	
IC403 404, 425	417 418 419 406
420 413,414	
423 421,422 424 419 415 416 417 418	
406	
IC404	701
Q , IC	D

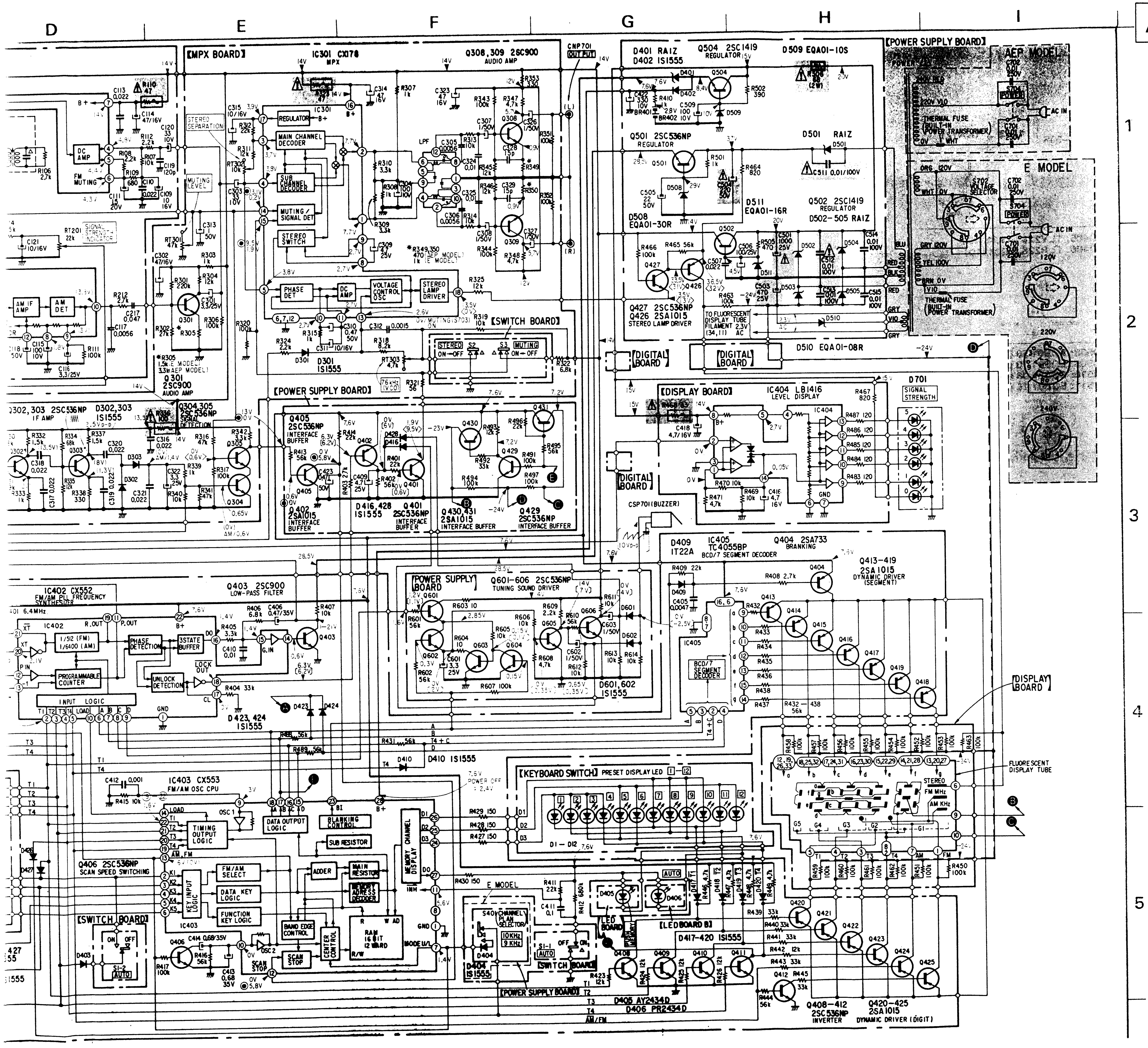
(POWER SUPPLY BOARD
DGITAL BOARD
DISPLAY BOARD
LED (A), (B) BOARD)

4-4. SCHEMATIC DIAGRAM

AEP,E model


A
B
C
D
1
2
3
4
5
【IF BOARD】
FM FRONT END
TM701 ANTENNA
FM ANT
FM ANT
GND
300Ω
75Ω
FM
AM
FM RF AMP
FM MIX
IFT
FM IF AMP
BUFFER
FM OSC
(B+) B1
IF
(TUN) B2
F.OUT
C101 0.022
R101 100
C102 47 16V
C112 0.022
IC201 CX168
FM IF/AM
IC201
R103 33
R104 330
C104 0.022
CF101
FM IF AMP
FM DET
R105 15k
T203
R106 2.7k
DC AMP
FM MUTING
B+
C108 0.022
SIGNAL LEVEL DETECTION
AM INPUT LEVEL SIGNAL
C106 0.022
R114 1.5k
C107 0.022
C121 10/16V
RT201 22k
R102 68k
C103 0.022
R202 220k
D202
T102 (MW ANT)
C202 0.022
C203 7p
CT102
C213 100/10V
C212 0.022
L201 47μH
R201 68
C201 0.0012
AM ATTE-NUATOR
AM MIX
AM OSC
T201
C215 30p
T202
C216 0.022
AM IF AMP
AM DET
TO AM ATTE-NUATOR
CF201
C118 0.47/50V
C115 100 10V
C116 3.3/25V
R111 100k
R203 68k
D201
C206 560p
T101 (MW OSC)
R204 100k
R205 82k
CT101
C204 0.022
C205 15p
R206 10k
C208 0.022
C207 3.3 25V
C209 0.022
R207 3.3k
FM/AM SWITCH
R220 4.7k
C214 3.3/25V
D201,202 SMV1380
DC VOLTAGE FOR TUNING FM: 3-21V AM: 1-21V
fMIN fMAX
D101, 203 1S1555
Q201 2SK30A AM OSC BUFFER
D101
R115 10k
C105 0.022
C210 0.022
R208 27k
D203
R211 10k
C211 0.022
R210 3.3k
R209 100k
【MPX BOARD】
Q306,307 2SC536NP
AM/FM SWITCHING
R327 2.7k
R329 2.7k
R326 100k
Q306
Q307
R328 68k
【POWER SUPPLY BOARD】
FM,AM
Q202 2SC536NP IF AMP
【IF BOARD】
R214 560k
T204
C218 0.022
R213 15k
R218 100
C220 0.022
CF202
R215 220k
R216 3.9k
C219 0.022
Q302, 303 2SC536NP IF AMP
R330 68k
R332 1.5k
R334 68k
Q302
Q303
C318 0.022
R331 3.9k
R333
C317 0.022
R335 12k
R338 330
【DIGITAL BOARD】
IC406 TC4069P ASTABLE MULTI
6Vp-p
SQUARE WAVE PRODUCE
IC406
C420 0.018
C421 0.056
R474 220k
R475 2.2k
C419 3.3/25V
R477 56k
R476 22k
20mSEC
IC401 CX554
1/8 DIVIDER(FM), FM/AM SWITCHING
C402 0.022
IC401
1/2
25kHz SHIFT
50kHz SHIFT
FM IN
GND
25k,S
50k,S
FM,AM
AM IN
1/8,1/4
B+
OUT
C404 0.022
C401 0.022
IC402 CX552
FM/AM PLL FREQUENCY SYNTHESIZER
XT401 6.4 MHz
C407 22p
C408 22p
C403 0.022
IC402
R.OUT
1/512 (FM) 1/6400 (AM)
PROGRAMMABLE COUNTER
INPUT LOGIC
T1 T2 T3 T4 LOAD
IC407 TC4011P GATE
D407,408 1S1555
R482 100k
R479 100k
D407
D408
R473 100k
RV701 200k
(R1) (R2)
PUSH ON SW
MEMORY (PUSH)
UP (f UP) (CLOCKWISE)
DOWN (f DOWN) (COUTERCLOCK WISE)
TUNING PUSH MEMORY
R480 22k
R478 56k
Q428
C415 0.1
R481 22k
Q428 2SC536NP PULSE DILAY
f up/DOWN: 0.6V
f up/DOWN: 2V
f up/DOWN: 5.8V
【KEYBOARD SWITCH】
S701
PRESET 1-12, AM, FM
1 2 3 4 5 6 7 8 9 10 11 12 FM AM
K1 K2 K3 K5
IC406
D415
D426,427 1S1555
D403,415 1S1555
Q406 2S
SCAN SPEE
【SWITCH
D403
CAUTION: □ ----CONTACT
-ww- ----RESISTOR

AEP,E model


D
E
F
G
H
I
1
2
3
4
5
[MPX BOARD]
IC301 CX178 MPX
Q308,309 2SC900 AUDIO AMP
CNP701 OUTPUT
REGULATOR
MAIN CHANNEL DECODER
SUB CHANNEL DECODER
MUTING/SIGNAL DET
STEREO SWITCH
PHASE DET
DC AMP
VOLTAGE CONTROL OSC
STEREO LAMP DRIVER
STEREO SEPARATION
MUTING LEVEL
SIGNAL STRENGTH INDICATOR
LPF
DC AMP
FM MUTING
AM IF AMP
AM DET
Q301 2SC900 AUDIO AMP
D301 1S1555
[SWITCH BOARD]
STEREO ON-OFF S2
S3 MUTING ON-OFF
Q302,303 2SC536NP IF AMP
D302,303 1S1555
Q304,305 2SC536NP SIGNAL DETECTION
[POWER SUPPLY BOARD]
Q405 2SC536NP INTERFACE BUFFER
Q402 2SA1015 INTERFACE BUFFER
D416,428 1S1555
Q401 2SC536NP INTERFACE BUFFER
Q430,431 2SA1015 INTERFACE BUFFER
Q429 2SC536NP INTERFACE BUFFER
D401 RA1Z
D402 1S1555
Q504 2SC1419 REGULATOR
D509 EQA01-10S
Q501 2SC536NP REGULATOR
D501 RA1Z
D508 EQA01-30R
D511 EQA01-16R
Q502 2SC1419 REGULATOR
D502-505 RA1Z
Q427 2SC536NP
Q426 2SA1015
STEREO LAMP DRIVER
TO FLUORESCENT DISPLAY TUBE FILAMENT 2.3V (34,11) AC
D510 EQA01-08R
[DIGITAL BOARD]
[POWER SUPPLY BOARD]
AEP MODEL
E MODEL
THERMAL FUSE (BUILT-IN POWER TRANSFORMER)
S704 POWER
S702 VOLTAGE SELECTOR
AC IN
120V
220V
240V
[DISPLAY BOARD]
IC404 LB1416 LEVEL DISPLAY
D701 SIGNAL STRENGTH
CSP701 (BUZZER)
IC402 CX552 FM/AM PLL FREQUENCY SYNTHESIZER
PHASE DETECTION
3STATE BUFFER
PROGRAMMABLE COUNTER
UNLOCK DETECTION
INPUT LOGIC
Q403 2SC900 LOW-PASS FILTER
[POWER SUPPLY BOARD]
Q601-606 2SC536NP TUNING SOUND DRIVER
D601,602 1S1555
D423,424 1S1555
D409 1T22A
IC405 TC4055BP BCD/7 SEGMENT DECODER
Q404 2SA733 BRANKING
Q413-419 2SA1015 DYNAMIC DRIVER (SEGMENT)
BCD/7 SEGMENT DECODER
[DISPLAY BOARD]
FLUORESCENT DISPLAY TUBE
STEREO
FM MHz
AM KHz
D410 1S1555
IC403 CX553 FM/AM OSC CPU
TIMING OUTPUT LOGIC
DATA OUTPUT LOGIC
BLANKING CONTROL
SUB RESISTOR
MEMORY CHANNEL DISPLAY
ADDER
MAIN RESISTOR
MEMORY ADRESS DECODER
RAM 16 BIT 12 WARD
BAND EDGE CONTROL
CENTER CONTROL
SCAN STOP
FM/AM SELECT
DATA KEY LOGIC
FUNCTION KEY LOGIC
KEY INPUT LOGIC
Q406 2SC536NP SCAN SPEED SWITCHING
[SWITCH BOARD]
S1-2 AUTO
[KEYBOARD SWITCH] PRESET DISPLAY LED 1-12
E MODEL
S401 CHANNEL PLAN SELECTOR
10KHz
9KHz
D404 1S1555
S1-1 AUTO
[SWITCH BOARD]
[POWER SUPPLY BOARD]
[LED BOARD]
[LED BOARD B]
D417-420 1S1555
D405 AY2434D
D406 PR2434D
Q408-412 2SC536NP INVERTER
Q420-425 2SA1015 DYNAMIC DRIVER (DIGIT)

Note: The components identified by shading and mark ⚠ are critical for safety. Replace only with part number specified.

Note:

- All capacitors are in μF unless otherwise noted. pF : μμF 50 WV or less are not indicated except for electrolytics.
- All resistors are in ohms, ¼ W unless otherwise noted. kΩ : 1000Ω, MΩ : 1000 kΩ
- ⊡ : fusible resistor.
- △ : internal component.
- ─── : B+ bus.
- ▭ : panel designation.
- ▭ : adjustment for repair.
- - - - : B− bus.
- Voltage variations may be noted due to normal production tolerances.
- Voltages are dc with respect to ground unless otherwise noted.
- Readings are taken under no signal conditions with a VOM (20 kΩ/V).
  no mark: FM no signal conditions of 88 MHz.
  (STEREO switch: ON)
  (MUTING switch: OFF)
  ( ): AM no signal conditions of 520 kHz.
  [ ]: While receiving signal is changed.
  ⊙ : When either FM signal or AM signal is tuned.
  FM: When the FM signal is tuned.
  AM: When the AM signal is tuned.
  < >: When the FM stereo signal is tuned.
- Waveforms are measured with respect to ground.
- Switch

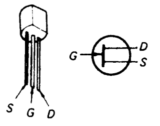
Ref. No.	Switch	Position
S1	AUTO	OFF
S2	STEREO	ON
S3	MUTING	OFF
S401	channel plan selector (E model)	9 kHz
S702	VOLTAGE SELECT (E model)	120 V
S704	POWER	OFF

AEP,E model

Replacement Semiconductors

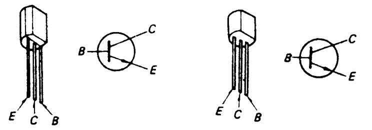
For replacement, use semiconductors except in ( ).

Q201: 2SK23A-840 (2SK30A)

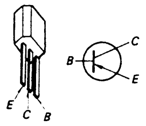


Q202, 302–307
Q401, 405, 406
Q408–412,
Q501, 503
Q427–429
Q601–606
: 2SC1364 (2SC536NP)

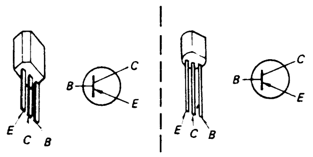
Q301, 308
Q403, 309
: 2SC1362 (2SC900)


B
C
E
E C B
B
C
E
E C B

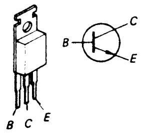
Q402,
Q413–426 : 2SA1027R (2SA1015)
Q430, 431



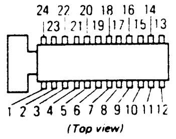
Q404: 2SA1027R (2SA733)


B
C
E
E C B
B
C
E
E C B

Q502, 504: 2SC1061 (2SC1419)

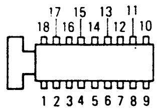


IC201: CX168


24 22 20 18 16 14
23 21 19 17 15 13
1 2 3 4 5 6 7 8 9 10 11 12

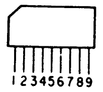
(Top view)

IC301: CX178

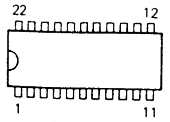

17 15 13 11
18 16 14 12 10
1 2 3 4 5 6 7 8 9

(Top view)

IC401: CX554

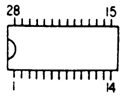


IC402: CX552A (CX552)



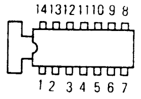
(Top view)

IC403: CX553A(CX553)



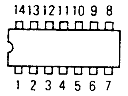
(Top view)

IC404: LB1416


14 13 12 11 10 9 8
1 2 3 4 5 6 7

(Top view)

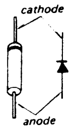
IC405: TC4055BP
IC406: MSM4069 (TC4069P)
IC407: TC4011BP (TC4011P)


14 13 12 11 10 9 8
1 2 3 4 5 6 7

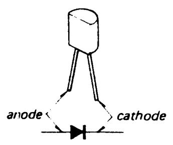
(Top view)

D101, 203
D301–303
D402–404
D407,408
D410
D415–420
D423,424
D426–428
D601,602
: 1S1555

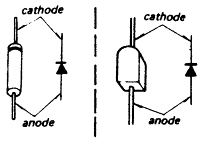
D409: 1T22AM (1T22A)


cathode
anode

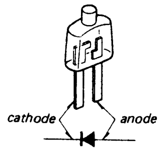
D201, 202: SMV1380


anode
cathode

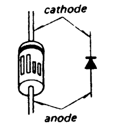
D401
D501–505
: 10E2 (RA1Z)


cathode
anode
cathode
anode

D405: TLY226 (AY2434D)
D406: TLR226 (PR2434D)


cathode
anode

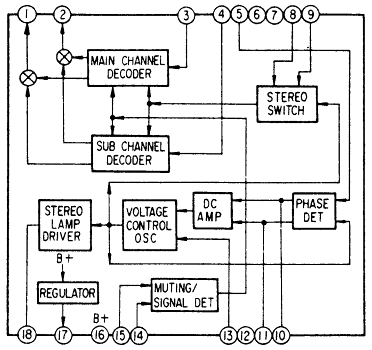
D508: EQB01-30 (EQA01-30R)
D509: EQB01-10 (EQA01-10S)
D510: EQB01-08 (EQA01-08R)
D511: EQB01-16 (EQA01-16R)


cathode
anode

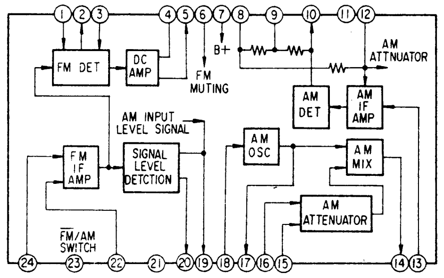
AEP,E model

- **Block Diagram of ICs**

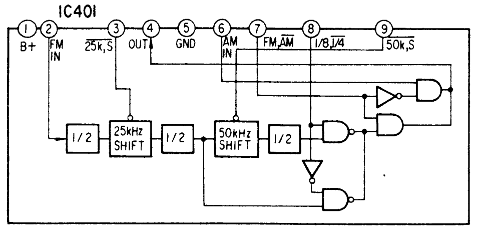
IC301


MAIN CHANNEL DECODER
STEREO SWITCH
SUB CHANNEL DECODER
STEREO LAMP DRIVER
VOLTAGE CONTROL OSC
DC AMP
PHASE DET
B+
REGULATOR
B+
MUTING/ SIGNAL DET

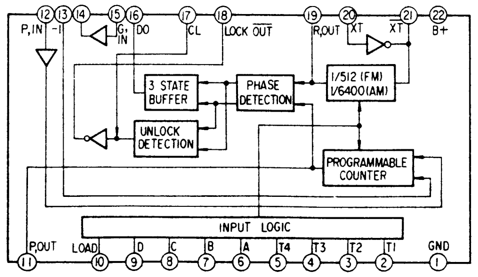
IC201


FM DET
DC AMP
B+
FM MUTING
AM ATTNUATOR
AM DET
AM IF AMP
AM INPUT LEVEL SIGNAL
FM IF AMP
SIGNAL LEVEL DETCTION
AM OSC
AM MIX
AM ATTENUATOR
FM/AM SWITCH

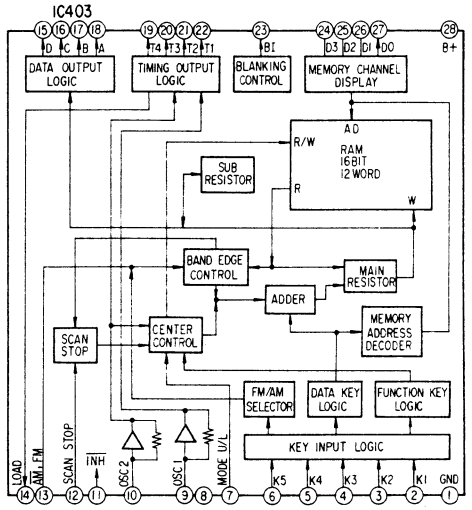
IC401


B+
FM IN
25k,S
OUT
GND
AM IN
FM,AM
1/8,1/4
50k,S
1/2
25kHz SHIFT
1/2
50kHz SHIFT
1/2

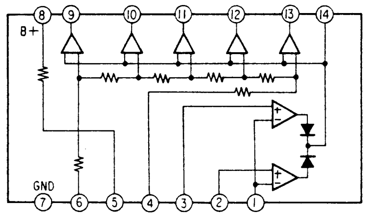
IC402


P,IN
-I
G, IN
DO
CL
LOCK OUT
R,OUT
XT
XT
B+
3 STATE BUFFER
PHASE DETECTION
1/512 (FM) 1/6400(AM)
UNLOCK DETECTION
PROGRAMMABLE COUNTER
INPUT LOGIC
P,OUT
LOAD
D
C
B
A
T4
T3
T2
T1
GND

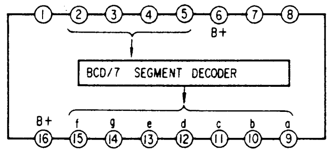
IC403


D
C
B
A
T4
T3
T2
T1
BI
D3
D2
DI
DO
B+
DATA OUTPUT LOGIC
TIMING OUTPUT LOGIC
BLANKING CONTROL
MEMORY CHANNEL DISPLAY
AD
R/W
RAM 16BIT 12WORD
R
W
SUB RESISTOR
BAND EDGE CONTROL
MAIN RESISTOR
ADDER
CENTER CONTROL
SCAN STOP
MEMORY ADDRESS DECODER
FM/AM SELECTOR
DATA KEY LOGIC
FUNCTION KEY LOGIC
KEY INPUT LOGIC
LOAD
AM, FM
SCAN STOP
INH
OSC 2
OSC 1
MODE U/L
K5
K4
K3
K2
K1
GND

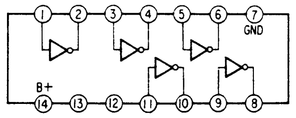
IC404



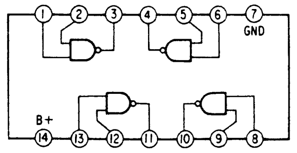
IC405


B+
BCD/7 SEGMENT DECODER
B+
f
g
e
d
c
b
a

IC406

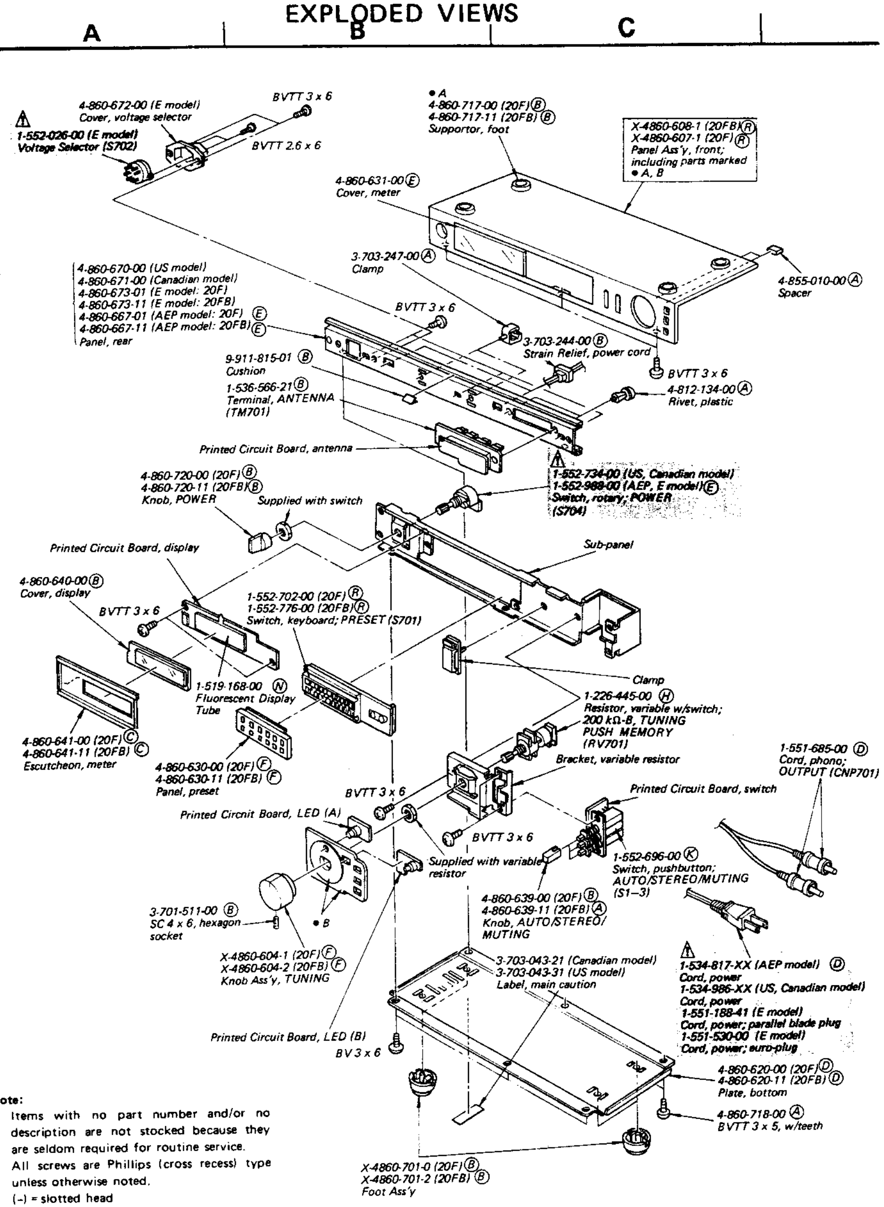


IC407



SECTION 5
EXPLODED VIEWS

5-1.

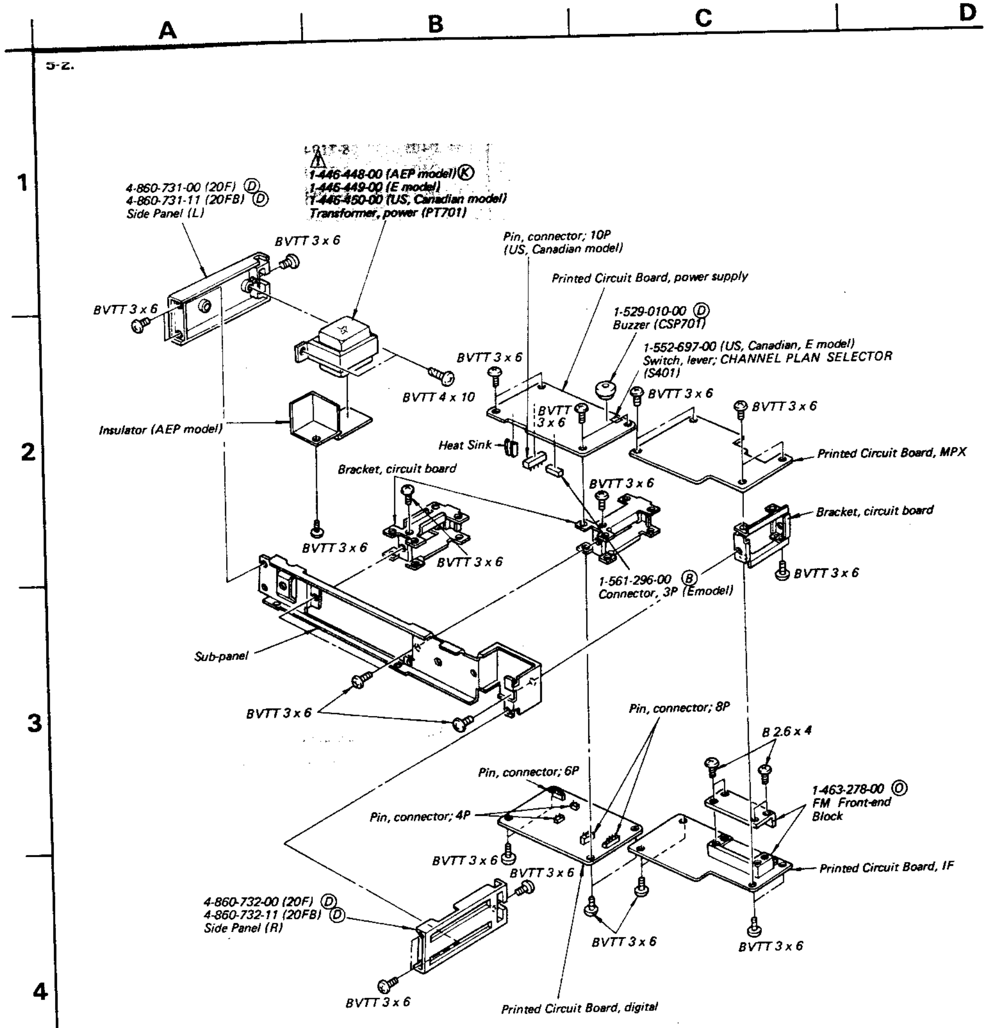

A
B
C
1
2
3
4
5
4-860-672-00 (E model)
Cover, voltage selector
BVTT 3 x 6
⚠ 1-552-026-00 (E model)
Voltage Selector (S702)
BVTT 2.6 x 6
• A
4-860-717-00 (20F)Ⓑ
4-860-717-11 (20FB) Ⓑ
Supportor, foot
X-4860-608-1 (20FB)Ⓡ
X-4860-607-1 (20F)Ⓡ
Panel Ass'y, front; including parts marked • A, B
4-860-631-00Ⓔ
Cover, meter
3-703-247-00Ⓐ
Clamp
4-855-010-00Ⓐ
Spacer
4-860-670-00 (US model)
4-860-671-00 (Canadian model)
4-860-673-01 (E model: 20F)
4-860-673-11 (E model: 20FB)
4-860-667-01 (AEP model: 20F) Ⓔ
4-860-667-11 (AEP model: 20FB)Ⓔ
Panel, rear
BVTT 3 x 6
3-703-244-00Ⓑ
Strain Relief, power cord
9-911-815-01 Ⓑ
Cushion
BVTT 3 x 6
1-536-566-21Ⓑ
Terminal, ANTENNA (TM701)
4-812-134-00Ⓐ
Rivet, plastic
Printed Circuit Board, antenna
⚠ 1-552-734-00 (US, Canadian model)
1-552-988-00 (AEP, E model)Ⓔ
Switch, rotary; POWER (S704)
4-860-720-00 (20F)Ⓑ
4-860-720-11 (20FB)Ⓑ
Knob, POWER
Supplied with switch
Printed Circuit Board, display
Sub-panel
4-860-640-00Ⓑ
Cover, display
BVTT 3 x 6
1-552-702-00 (20F) Ⓡ
1-552-776-00 (20FB)Ⓡ
Switch, keyboard; PRESET (S701)
Clamp
1-519-168-00 Ⓝ
Fluorescent Display Tube
1-226-445-00 Ⓗ
Resistor, variable w/switch; 200 kΩ-B, TUNING PUSH MEMORY (RV701)
4-860-641-00 (20F)Ⓒ
4-860-641-11 (20FB) Ⓒ
Escutcheon, meter
4-860-630-00 (20F)Ⓕ
4-860-630-11 (20FB) Ⓕ
Panel, preset
Bracket, variable resistor
1-551-685-00 Ⓓ
Cord, phono; OUTPUT (CNP701)
BVTT 3 x 6
Printed Circuit Board, switch
Printed Circnit Board, LED (A)
BVTT 3 x 6
Supplied with variable resistor
1-552-696-00 Ⓚ
Switch, pushbutton; AUTO/STEREO/MUTING (S1–3)
3-701-511-00 Ⓑ
SC 4 x 6, hexagon socket
• B
4-860-639-00 (20F)Ⓑ
4-860-639-11 (20FB)Ⓐ
Knob, AUTO/STEREO/MUTING
X-4860-604-1 (20F)Ⓕ
X-4860-604-2 (20FB)Ⓕ
Knob Ass'y, TUNING
3-703-043-21 (Canadian model)
3-703-043-31 (US model)
Label, main caution
⚠ 1-534-817-XX (AEP model) Ⓓ
Cord, power
1-534-986-XX (US, Canadian model)
Cord, power
1-551-188-41 (E model)
Cord, power; parallel blade plug
1-551-530-00 (E model)
Cord, power; euro-plug
Printed Circuit Board, LED (B)
BV 3 x 6
4-860-620-00 (20F)Ⓓ
4-860-620-11 (20FB)Ⓓ
Plate, bottom
4-860-718-00 Ⓐ
BVTT 3 x 5, w/teeth
X-4860-701-0 (20F)Ⓑ
X-4860-701-2 (20FB) Ⓑ
Foot Ass'y

Note:
- Items with no part number and/or no description are not stocked because they are seldom required for routine service.
- All screws are Phillips (cross recess) type unless otherwise noted.
  (-) = slotted head
- Circled letters (Ⓐ to Ⓩ) are applicable to European models only.

Note: The components identified by shading and mark ⚠ are critical for safety. Replace only with part number specified.

Note: Les composants identifiés par un tramé et une marque ⚠ sont critiques pour la sécurité. Ne les remplacer que par une pièce portant le numéro spécifié.

5-2.


A
B
C
D
1
2
3
4
5
4-860-731-00 (20F) Ⓓ
4-860-731-11 (20FB) Ⓓ
Side Panel (L)
⚠ 1-446-448-00 (AEP model)Ⓚ
1-446-449-00 (E model)
1-446-450-00 (US, Canadian model)
Transformer, power (PT701)
BVTT 3 x 6
BVTT 3 x 6
Pin, connector; 10P (US, Canadian model)
Printed Circuit Board, power supply
1-529-010-00 Ⓓ
Buzzer (CSP701)
1-552-697-00 (US, Canadian, E model)
Switch, lever; CHANNEL PLAN SELECTOR (S401)
BVTT 3 x 6
BVTT 4 x 10
BVTT 3 x 6
BVTT 3 x 6
BVTT 3 x 6
Insulator (AEP model)
Heat Sink
Printed Circuit Board, MPX
Bracket, circuit board
BVTT 3 x 6
Bracket, circuit board
BVTT 3 x 6
BVTT 3 x 6
BVTT 3 x 6
1-561-296-00 Ⓑ
Connector, 3P (Emodel)
Sub-panel
BVTT 3 x 6
Pin, connector; 8P
B 2.6 x 4
Pin, connector; 6P
1-463-278-00 Ⓞ
FM Front-end Block
Pin, connector; 4P
BVTT 3 x 6
BVTT 3 x 6
Printed Circuit Board, IF
4-860-732-00 (20F) Ⓓ
4-860-732-11 (20FB) Ⓓ
Side Panel (R)
BVTT 3 x 6
BVTT 3 x 6
BVTT 3 x 6
Printed Circuit Board, digital

Note: The components identified by shading and mark ⚠ are critical for safety. Replace only with part number specified.

Note:
- Items with no part number and/or no description are not stocked because they are seldom required for routine service.
- All screws are Phillips (cross recess) type unless otherwise noted.
  (-) = slotted head
- Circled letters (Ⓐ to Ⓩ) are applicable to European models only.

Note: Les composants identifiés par un tramé et une marque ⚠ sont critiques pour la sécurité. Ne les remplacer que par une pièce portant le numéro spécifié.

Note: Circled letters (Ⓐ to Ⓩ) are applicable to European models only.

SECTION 6
ELECTRICAL PARTS LIST

SEMICONDUCTORS

Transistors

Ref. No.	*Part No.*	*Description*
⇒Q201	8-722-384-01	Ⓒ 2SK23A-840 (blue)
⇒Q202	8-729-663-47	Ⓒ 2SC1364
⇒Q301	8-729-665-47	Ⓑ 2SC1362
⇒Q302–307	8-729-663-47	Ⓒ 2SC1364
⇒Q308, 309	8-729-665-47	Ⓑ 2SC1362
⇒Q401	8-729-663-47	Ⓒ 2SC1364
⇒Q402	8-729-612-77	Ⓑ 2SA1027R
⇒Q403	8-729-665-47	Ⓑ 2SC1362
⇒Q404	8-729-612-77	Ⓑ 2SA1027R
⇒Q405, 406 ⇒Q408–412	8-729-663-47	Ⓒ 2SC1364
⇒Q413–426	8-729-613-77	Ⓑ 2SA1027R
⇒Q427,428	8-729-663-47	Ⓒ 2SC1364
⇒Q429	8-729-663-47	Ⓒ 2SC1364 (AEP, E model)
⇒Q430,431	8-729-612-77	Ⓑ 2SA1027 (AEP, E model)
⇒Q501	8-729-663-47	Ⓒ 2SC1364
⇒Q502	8-729-316-12	Ⓓ 2SC1061
⇒Q503	8-729-663-47	Ⓒ 2SC1364 (US, Canadian model)
⇒Q504	8-729-316-12	Ⓓ 2SC1061
⇒Q601–606	8-729-663-47	Ⓒ 2SC1364

ICs

Ref. No.	*Part No.*	*Description*
IC201	8-751-680-01	Ⓘ CX168
IC301	8-751-780-00	Ⓖ CX178
IC401	8-759-205-54	Ⓚ CX554
⇒IC402	8-759-200-52	Ⓚ CX552A
⇒IC403	8-759-200-53	Ⓟ CX553A
IC404	8-759-814-16	Ⓕ LB1416
IC405	8-759-240-55	Ⓔ TC4055BP
IC406	8-759-904-69	Ⓒ MSM4069
IC407	8-759-240-11	Ⓑ TC4011BP

Diodes

Ref. No.	*Part No.*	*Description*
D101	8-719-815-55	Ⓑ 1S1555
D201, 202	8-719-913-80	Ⓔ SMV1380
D203 D301–303	8-719-815-55	Ⓑ 1S1555
⇒D401	8-719-200-02	Ⓑ 10E2
D402, 403	8-719-815-55	Ⓑ 1S1555
D404	8-719-815-55	1S1555 (US, Canadian, E model)
⇒D405	8-719-802-26	Ⓑ TLY226
⇒D406	8-719-812-26	Ⓑ TLR226
D407, 408	8-719-815-55	Ⓑ 1S1555
⇒D409	8-719-422-21	Ⓑ 1T22AM
D410 D415–420 D423, 424 D426	8-719-815-55	Ⓑ 1S1555
D427, 428	8-719-815-55	Ⓑ 1S1555 (AEP, E model)
⇒D501–505	8-719-200-02	Ⓑ 10E2
⇒D506, 507	8-719-200-02	10E2 (US, Canadian model)
⇒D508	8-719-931-30	Ⓑ EQB01-30
⇒D509	8-719-931-10	Ⓑ EQB01-10
⇒D510	8-719-931-07 8-719-931-08	EQB01-07 (US, Canadian model) Ⓑ EQB01-08 (AEP, E model)
⇒D511	8-719-931-16	Ⓑ EQB01-16 (AEP, E model)
D601, 602	8-719-815-55	Ⓑ 1S1555

⇒: Due to standardization, interchangeable replacements may be substituted for parts specified in the diagrams.

Note: The components identified by shading and mark ⚠ are critical for safety. Replace only with part number specified.

COIL AND TRANSFORMERS

Ref. No.	*Part No.*	*Description*
L201	1-408-164-00	Ⓑ 47 μH, microinductor
PT701	⚠1-446-448-00 ⚠1-446-449-00 ⚠1-446-450-00	Ⓚ Power (AEP model) Power (E model) Power (US, Canadian model)
T101	1-405-829-00	Ⓑ MW Osc
T102	1-401-765-00	Ⓑ MW Ant
T201	1-409-323-00	Ⓑ MW IFT
T202	1-409-324-00	Ⓑ MW IFT
T203	1-404-167-00	Ⓓ FM Discriminator
T204	1-527-400-00	Ⓑ MW IFT

CAPACITORS

All capacitors are in μF and ceramic unless otherwise noted. 50 WV or less are not indicated except for electrolytics. p : μμF, elect : electrolytic

Ref. No.	*Part No.*	*Description*		
C101	1-101-005-00	Ⓐ 0.022		
C102	1-123-319-00	Ⓑ 47	16V	elect
C103–108	1-101-005-00	Ⓐ 0.022		

Note: Les composants identifiés par un tramé et une marque ⚠ sont critiques pour la sécurité. Ne les remplacer que par une pièce portant le numéro spécifié.

Note: Circled letters (Ⓐ to Ⓩ) are applicable to European models only.

Ref. No.	*Part No.*	*Description*		
C109	1-121-651-00	Ⓐ 10	16V	elect
C110	1-101-005-00	Ⓐ 0.022		
C111	1-131-202-00	Ⓑ 1.5	20V	tantalum
C112, 113	1-101-005-00	Ⓐ 0.022		
C114	1-121-409-00	Ⓐ 47	16V	elect
C115	1-121-414-00	Ⓐ 100	10V	elect
C116	1-121-392-00	Ⓐ 3.3	25V	elect
C117	1-108-355-00	Ⓐ 0.0056		mylar
C118	1-121-726-00	Ⓐ 0.47	50V	elect
C119	1-102-816-00	Ⓐ 120p		
C120	1-121-402-00	Ⓐ 33	10V	elect
C121	1-121-651-00	Ⓐ 10	16V	elect
C201	1-108-351-00	Ⓐ 0.0012		mylar
C202	1-101-005-00	Ⓐ 0.022		
C203	1-102-944-00	Ⓐ 7p		
C204	1-101-005-00	Ⓐ 0.022		
C205	1-102-951-00	Ⓐ 15p		
C206	1-104-071-00	Ⓑ 560p		styrol
C207	1-121-392-00	Ⓐ 3.3	25V	elect
C208–212	1-101-005-00	Ⓐ 0.022		
C213	1-121-414-00	Ⓐ 100	10V	elect
C214	1-121-392-00	Ⓐ 3.3	25V	elect
C215	1-102-962-00	Ⓐ 30p		
C216	1-101-005-00	Ⓐ 0.022		
C217	1-108-246-00	Ⓐ 0.047		mylar
C218–220	1-101-005-00	Ⓐ 0.022		
C301	1-121-392-00	Ⓐ 3.3	25V	elect
C302	1-121-409-00	Ⓐ 47	16V	elect
C303	1-121-402-00	Ⓐ 33	10V	elect
C304	1-121-414-00	Ⓐ 100	10V	elect
C305, 306	1-108-355-00	Ⓐ 0.0056		mylar
C307, 308	1-121-391-00	Ⓐ 1	50V	elect
C309	1-121-395-00	Ⓐ 4.7	25V	elect
C310	1-121-726-00	Ⓐ 0.47	50V	elect
C311	1-121-651-00	Ⓐ 10	16V	elect
C312	1-104-081-00	Ⓐ 0.0015		styrol
C313	1-121-391-00	Ⓐ 1	50V	elect
C314	1-121-409-00	Ⓐ 47	16V	elect
C315	1-121-651-00	Ⓐ 10	16V	elect
C316–321	1-101-005-00	Ⓐ 0.022		
C322	1-121-392-00	Ⓐ 3.3	25V	elect
C323	1-121-409-00	Ⓐ 47	16V	elect
C324, 325	1-108-583-00 1-108-579-00	0.015 (US, Canadian model) Ⓐ 0.01 (E, AEP model)		mylar mylar
C326, 327	1-121-391-00	Ⓐ 1	50V	elect
C328, 329	1-102-951-00	Ⓐ 15p		
C401–404	1-101-005-00	Ⓐ 0.022		
C405	1-108-234-00	Ⓐ 0.0047		mylar
C406	1-131-213-00	Ⓑ 0.47	35V	tantalum
C407, 408	1-102-959-00	Ⓐ 22p		
C409	1-121-395-00	Ⓐ 4.7	25V	elect
C410	1-108-239-00	Ⓐ 0.01		mylar
C411	1-108-251-00	Ⓑ 0.1		mylar
C412	1-108-227-00	Ⓐ 0.001		mylar
C413, 414	1-131-214-00	Ⓑ 0.68	35V	tantalum
C415	1-108-251-00	Ⓐ 0.1		mylar
C416, 418	1-131-232-00	Ⓑ 4.7	16V	tantalum
C419	1-121-392-00	Ⓐ 3.3	25V	elect
C420	1-108-358-00	Ⓐ 0.018		mylar
C421	1-108-361-00	Ⓐ 0.056		mylar
C422	1-123-309-00	Ⓑ 330	10V	elect
C423	1-121-726-00	Ⓐ 0.47	50V	elect
C501	⚠1-123-337-00	Ⓑ 1000	25V	elect
C503	⚠1-123-336-00	Ⓑ 470	25V	elect
C504	⚠1-123-361-00	Ⓑ 220	50V	elect
C505	1-121-152-00	Ⓐ 22	50V	elect
C506	1-121-409-00 1-123-333-00	47 (US, Canadian model) Ⓐ 100 (E, AEP model)	16V 25V	elect elect
C507	1-101-005-00	Ⓐ 0.022		
C508	⚠1-123-324-00	1000 (US, Canadian model)	16V	elect
C509	1-121-414-00	Ⓐ 100	10V	elect
C510–516	⚠1-108-377-00	0.01 (US, Canadian model)	100V	mylar

Note: The components identified by shading and mark ⚠ are critical for safety. Replace only with part number specified.

Note: Les composants identifiés par un tramé et une marque ⚠ sont critiques pour la sécurité. Ne les remplacer que par une pièce portant le numéro spécifié.

Note: Circled letters (Ⓐ to Ⓩ) are applicable to European models only.

Ref. No.	*Part No.*	*Description*
C511–515	**⚠1-108-377-00**	**Ⓐ 0.01 100V mylar (AEP, E model)**
C601	1-121-392-00	Ⓐ 3.3 25V elect
C602, 603	1-121-391-00	Ⓐ 1 50V elect
C701, 702	**⚠1-130-196-00**	**Ⓓ 0.01 250 V polyethylene (E, AEP model)**
CT101, 102	1-141-171-00	Ⓑ Trimmer

RESISTORS

All resistors are in ohms. Common ¼W carbon resistors are omitted. Check schematic the diagram for values.

Ref. No.	*Part No.*	*Description*
R101	**⚠1-217-399-00**	**Ⓑ 100 ¼W fusible**
R110	**⚠1-217-395-00**	**Ⓑ 47 ¼W fusible**
R218	**⚠1-217-399-00**	**Ⓑ 100 ¼W fusible**
R323	**⚠1-217-395-00**	**Ⓑ 47 ¼W fusible**
R336	**⚠1-217-399-00**	**Ⓑ 100 ¼W fusible**
R468	**⚠1-217-393-00**	**Ⓑ 33 ¼W fusible**
[illegible]	**⚠1-206-483-00**	**Ⓑ 68 2W metal oxide (nonflammable) (AEP, E model)**
[illegible]	**⚠1-202-723-00**	**2.2M ½W composition (US, Canadian model)**
RT201	1-224-646-XX	Ⓑ 22 k-B, adjustable; SIGNAL STRENGTH indicator
RT301	1-224-647-XX	Ⓑ 47 k-B, adjustable; muting level
RT302	1-224-645-XX	Ⓑ 10 k-B, adjustable; FM stereo separation
RT303	1-224-644-XX	Ⓑ 4.7 k-B, adjustable; 76 kHz
RV701	1-226-445-00	Ⓗ 200 k-B, variable; TUNING PUSH MEMORY (including switch)

SWITCHES

Ref. No.	*Part No.*	*Description*
S1–3	1-552-696-00	Ⓚ Pushbutton, AUTO/STEREO/MUTING
S401	1-552-697-00	Lever, CHANNEL PLAN SELECTOR (US,Canadian,E model)
S701	1-552-702-00	Ⓡ Keyboard, PRESET (20F)
	1-552-776-00	Ⓡ Keyboard, PRESET (20FB)
S702	**⚠1-552-026-00**	**Voltage Selector (E model)**
S704	**⚠1-552-734-00**	**Rotary, POWER (US, Canadian model)**
	⚠1-552-988-00	**Ⓔ Rotary, POWER (E, AEP model)**

MISCELLANEOUS

Ref. No.	*Part No.*	*Description*
BR401, 402	1-528-058-00	Ⓕ Battery
CF101	1-527-277-91	Ⓕ Filter, solid state (AEP, E model)
	1-527-278-XX	Filter, solid state (US, Canadian model)
CF201	1-527-397-00	Ⓒ Filter, ceramic
CF202	1-527-399-00	Ⓒ Filter, ceramic
CNP701	1-551-685-00	Ⓓ Cord, phono; OUTPUT
CP701	**⚠1-231-326-11**	**Encapsulated Component (US, Canadian model)**
CSP701	1-529-010-00	Ⓓ Buzzer
LPF	1-231-574-00	Ⓓ Filter, low-pass
TM701	1-536-566-21	Ⓑ Terminal, ANTENNA
XT401	1-527-398-00	Ⓔ Crystal Oscillator, 6.4 MHz
	1-463-278-00	Ⓞ FM Front-end Block
	1-501-193-21	Ⓑ Antenna
	1-519-168-00	Ⓝ Fluorescent Display Tube
	⚠1-534-817-XX	**Ⓓ Cord, power (AEP model)**
	⚠1-534-986-XX	**Cord, power (US, Canadian model)**
	1-535-506-00	Ⓐ Connector
	⚠1-551-188-41	**Cord, power; parallel blade plug (E model)**
	⚠1-551-530-00	**Cord, power; euro-plug (E model)**
	1-561-296-00	Ⓑ Connector; 3p

ACCESSORIES AND PACKING MATERIALS

Part No.		*Description*
US model:		
3-770-682-21		Manual, instruction; GG-20F/FB (US model)
AEP, Canadian model:		
3-770-682-21	Ⓓ	Manual, instruction; English; GG-20F/FB
3-770-682-31	Ⓘ	Manual, instruction; French
E model:		
3-770-682-21		Manual, instruction; English; GG-20F/FB
3-770-682-31		Manual, instruction; French; GG-20F/FB
3-770-682-51		Manual, instruction; Spanish; GG-20F
3-794-390-11	Ⓒ	Card, operation
4-860-646-00	Ⓐ	Sheet, protection
4-860-648-00	Ⓒ	Cushion
4-860-663-00	Ⓓ	Carton (20F)
4-860-664-00	Ⓓ	Carton (20FB)
4-860-669-00	Ⓑ	Manual, instruction; AM antenna

Note: The components identified by shading and mark ⚠ are critical for safety. Replace only with part number specified.

Note: Les composants identifiés par un tramé et une marque ⚠ sont critiques pour la sécurité. Ne les remplacer que par une pièce portant le numéro spécifié.

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STEREO TUNER ST-20F/20FB

AEP Model

SUPPLEMENT

File this supplement with the service manual.

The tuner (ST-20F/20FB) in the stereo system (GG-20F/20FB) has been sold separately.
The difference of the parts between the tuner only and the tuner in the system are as follows:

Description	Part No.	
	tuner in the system	tuner alone
Antenna, ribbon	1-501-193-21	1-501-184-00
Bag, plastic	–	3-701-625-00
Manual, instruction		
English	3-770-682-21	3-783-251-11
French	3-770-682-31	
Carton	4-860-663-00	4-860-676-00

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